

NEW INVENTIONS \* MECHANICS \* MONEY MAKING IDEAS 55 HOME WORKSHOP PLANS AND HINTS \* 350 PICTURES

# Let the piston tell you the the facts

#### about KNOCKING GASOLINE

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"Like the blow of a thousand-pound aledge-hammer comes the terrific force of the KNOCK. No piston can move fast enough to absorb this violent power. All I can do is take it on the nose. Then recovering from the shock, I try to go on my way. But the gasoline is all burned. Power that should be pressing me down now has escaped—turned into heat.

"Yes, that's the life of a piston in some folks' cars."

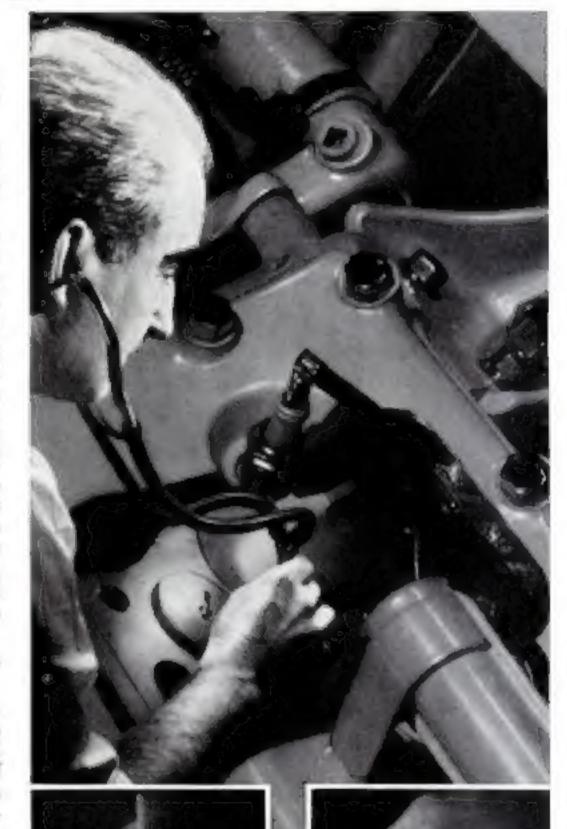
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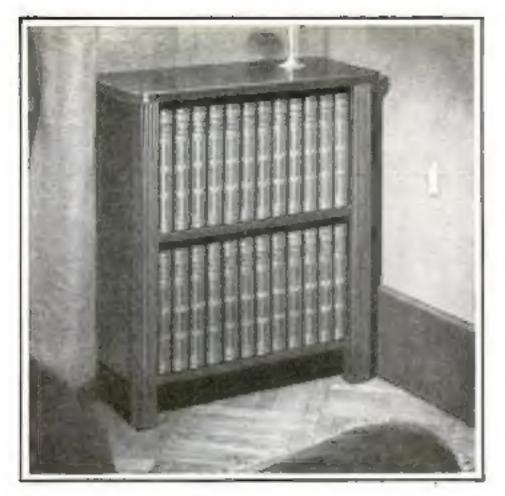
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LOOK INSIDE THE CYLINDERS Through a quartz window in the cylinder head of a modern high compression motor, Detroit engineers took this photograph of the uneven, waste of engineers of ordinary passione. That whate-hot hoe is knock

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#### Table of Contents for October, 1932

LEADING ARTICLES *
High-Flying Planes to Race Sun Across Atlantic  By Edwin Teale 13  Why two nations vie to reach stratosphere airways
Marine Tractor Speeds Docking of Big Liners  Drawing by B. G. Seielstad 15  Details of an inventor's remarkable substitute for sugbouts
Help Yourself to a Home By Andrew R. Boone 20 How thousands are turning free Government land into dwelling sites
Robot Hero Prevents Fire Panie
How Jungle Beasts Live near Big Cities
Protect Your Family by Recording Fingerprints  By Sterling Gleason 31  How you can preserve important personal data at home
Out of the Air on a Bag of Silk , By Randy Enslow 36 A three-time "ceterpillar" describes the thrills of perachute leaping
New War Tank Jumps Ditches
Robberies on a Gigantic Scale . By Orville H. Kneen 46 How master thieves steel golf greens, bouses and enilroses
FEATURES AND DEPARTMENTS
Cover Design By Edger F. Wittmach
Our Readers Say
Can You Invent 1e?
Housekeeping Tools to Minimize Labor
Experiments with Gas for Home Laboratory . By Raymond B. Wailer \$4
Winners in Our July Prize Contest
Supplying B-Current for Radio Ry John Care 57
New Radio Sets Tune Themselves By Alfred P. Lane 58
Car's Ammeter Can Warn of Ignition Trouble By Martin Saus 60
The Home Workshop
Timely Hints for Car Mechanics
Getting a Good Start in Home Movies . By Frederick D. Ryder, Jr. 74

AUTOMOBILES	
Odd Alarm at Gas Station 16 Seat-Like Bumper for Car Saves Pedestrain's Life	
Salety Wheel for Car Ends Blow-	
out Wrecks	
Container for Car Holds Family	
Streamlined Auto Designed by	
New Toilet Kit for Cur Has Run-	
Holes in Speciacles Shot Out	
Use Car's Engine to Run Scienors	
Non-Skid Pade Clemp to Car's	
Perked Car Guarded by Electric	
"Feeler"	
AVIATION	
Thrown Out at 2,000-Foot Alti-	
Balloon Lifts Glider	
Balloon Lifts Glider	
Fast Electric Car Tests Planes . 44 Masked Flyers Spray Insect Poi-	
Three Planes Write Big Question	
Mark in Sky "Flying Fish" Plane Hits Terrific	
Speed	
in Test	
ENGINEERING	
Explosions Drive Giant Turbines 40 Odd Rock Test Makes Dam Safe 45	
New Three-Way Bridge Will be 17,000 Feet Long	
MODELS	
Railroad Uses Toys to Find Loss Due to Wind	Ŀ
Builders Rude Model Boats 33 Railcoad Workers Build Model of	
Scale Model Motorhoat Planes	
Auxiliary Bench Aids the Model	
A Construction Kit for Our Span-	
ish Galleon 90	

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(Continued un page 4)

#### From the Counting Stones of the Romans

Came Our Word

#### CALCULATE

The ancient Romans had no adding machines. Few could even read or write. So their counting and reckoning was done with the aid of little stones used as counters. The Latin word for the pebble used in this way was calculus, derived from ealx meaning "limestone." From calculus was developed the verb calculare, "to calculate," and this is the immediate origin of our word calculate.

The branch of mathematics which we call calculus was named directly from the little counting stone of ancient Rome.

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Originally a Vender of Wine

The majory broker who engages is terre-evals directed operations taken his name from a humble orders. Broker to delived from the old Franch branging or brukter, a dante-tat form of breckier, "time the lates a runk to order in draw the liquor." Thus, the braker was to the Brut place & syinil vehiles



MEIGHBOR

Once Meant a Neur-by Farmer In Angle Same mask meant 'nigh.'
have,' kpd gelber meant device.
'Tarmer.' These has words user comblood into auchgaber, meaning these
atts, ''s near to farmer.' The soul
repears in postern hogisch as seighbor,
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OCTOBER, 1932

3

#### Popular Science Monthly for October, 1932

(Continued from page 2)	Air Blower Drives Strange French	Sheet of Paper Removes Dust from Aquarium
NEW DEVICES FOR THE		Old Inner Tube Hulds Rugs 79
HOME	UNUSUAL FACTS	CRAFTWORK
Self-Felding Iron Cord 52	AND IDEAS	Benches and Tools Hidden in
Automotic Oil Farnace 52	Gold Sprayed on Wood 16	Carved Cabinet
Rubber Hand Brush	Photographic Telescope Put in	Jig-Sewed Perts Form Unique Halloweon Rocker 66
Outshir-Duty Fats	Speedboat Prow Pierces Yarht . 17	Flow to Give Woodwork a Crackle
Versutile Handle	Cateteria on Fast Train	Finish
iloves Peel Petatoes 52	Victims in Alps Saved by Cable 17	Modern Book Ends and Lamp 67 Braiding Louther Handles 88
Rosat Con't Slip	Jota of Water Swiftly Cut Whirl- ing Plugs of Steel 18	
No Dust in Corners 53	Double - Deck Railway Coach	WOODWORKING
Water and Air Fag 53	Speeds Traffic	Space Saving Table and China
Autumatic Door Hank 54	Gun on Wheels	Completing the Framework of
Comb Cleaner	Concrete Road Lines Replace	Our Speedy Kayak
Glass Jar Tops Removed 53	Paint Strip 24	Making Reeded Chest Legs 81 Sunding Sharp Curves on Power
Non-Losable Paste Tube Cap 53	Taxi on Pontoons for Fest Joy	Jig Saw
Holds Ties and Caller Buttons . 51	X-Ray Helps Dogs Hear	IDEAS FOR THE
NEW PROCESSES AND	Theater Continues Warming Up Long After Sun Secs 28	IDEAS FOR THE
NEW PROCESSES AND	Wood Seeds, Buried Thirty Years,	HANDY MAN
INVENTIONS	Genw	Stand Supports Glass 64 This Little Night Lump Lights
Electric Organ Produces New	Amsteur's Home Built Observa- tory Wess Praise 30	When Lifted 4 65
Blade on Tiny New Sew Extends	Artificial Fog Seven Gurdens from	Skate Trapeze Gives Boys Exer-
Five Inches 16	Frost	What Use Can You Make of an
shovel, Pick and Hoe Combined	Skeleton Advertises Factory's Products 32	Old Auto Engine?
in New Tool	Secrets of Steel Found in Sand	Leaks in Roof , ,
Alurm	Piles	Drilling Open a Druin
Asbestos Shield Protects Firemen 19	Ferryboat Crosses River on Trol-	Real Plants Thrive in This Tiny Toy Greenhouse
Machine Teaches Fast Work on	Grows Scrawberries in Old Auto	Homemade Clamps for Gluing , 77
	Floodlights Being Midnight Golf 35	Home Workshop Blueprints 80 How to Fix Slipping Belts 81
Typewriter 19 Vibrating Taba Halp Musician's	Dil Penetrates Metal	Decoy Duck Hands Pack into
fundy Pencil Holds Indine 21	Find Mother-of-Pearl Clouds	Tray Clumps on Table Log 82
tydrant Breaks Ensily but Pro-	Miles above Earth	Storing Shell Hooks
vents Flood	Copy 800 Tree Leaves on Table	Insert for Saw Table
laws on Gerden Gloves Sove	Warning at Road Side Protects	Capter Well Holds Steel Wool . 84
Mands	Pracocks	Fanca Hidea Flower Pot 85
New Swivel Plug Won't Twist	Trolley Cars Now Tourist Cabins 45 Trees Suggest Arizona Drought	Replacing Eyelets in Doll 85 Goide for Angular Cuts
Electric Card	in 300 Years 45	Hanging Painthrushes in Can of
lammer Head Lacks On 29	Smokestack Is Ventilator in New	Corneob Dacts Used in Game . 88
Huminated Tracing Essel Speeds Art Work 29	Kill Japanese Boetles in New	Waterproof Match Heads 88
New Circular Saw Cuts at Any	Flies Raised to Order for Inmates	Noise-Makers from Stalks 89
Angle	Electric Clock Speeds Form Aue-	Can You Show Gus and Jos How
Automatic Iron Shutter Foils Window Thiel	Electric Clock Speeds Form Aug-	Casting Small Metal Parts 91
New Abrasive Cleaning Strip Is	Fish Lives in Sealed Globe 56	Battery Charger for Plating 95
Flexible	Use Steam Shovel to Uproot	
Engine Burns Its Carbon Mosex-	Photo Contest Awards	HINTS FOR THE
Portable Searchlight Has Half-		MECHANIC
Mile Range	FOR THE HOME OWNER	Incapensive Dividing Fixture 78
New Shelter from Poison Gm . 38 Whirlpool Tube Puts Hole in Sen 43	Removing Odors from a Thermos	Compression Gage Cock Improves
Robot Asswers Phone. Takes	Bottle	Blowtorch
Message	♦ Log Cabin Recreation Room , 72	<ul> <li>Wash Pan for Small Parts 94</li> </ul>

In This Issue—Hundreds of Articles and Pictures, Tell the Latest News of Laboratory Discoveries, Scientific Triumphs, and Amazing New Inventions

#### HOW TO GET PARTS FOR MAKING A BEAUTIFUL GALLEON MODEL

Whether you have ever built a ship model or not, here is your chance to make one of the most decorative and colorful little vessels ever designed—the Popular Science Mostfilly Spanish Galleon. Complete kits of selected materials have been prepared under the supervision of the Popular Science Homecraft Guild for distribution at the specially low price of \$6.45 each.

The kits contain everything necessary to make the model (except the paints), including the main centerpiece of the hull sawed out to the exact shape and size. Since this centerpiece is really the backbone of the whole model and the foundation upon which everything else is built up, it is a great aid to have it cut out from Captain McCann's own master template.

In each kit are the necessary pine blocks for the hull; 1/16 in. thick plywood of the best grade-and where can one ordinarily obtain plywood as thin as that? -for the bulwarks, decks, headboards, most tops, and similar parts; hardwood for such parts as the ladders, capetan, blocks, masts, yards, guns; pressboard for the stern gallery and other parts; an assortment of beads; round celluloid for deadeyes; muslin for sails; two cast metalanchors; brass wire; three sizes of corefully selected linen rigging line; and a variety of other parts. The wood, for the most part, is cut to the exact thickness and width required. In addition, Portland SCIENCE MONTHLY Blueprints Nos. 46 and 47 and an illustrated instruction book are given with each set of parts.

You will find an illustration of the model on page 90 of this issue. Thousands of readers have already built it successfully; in fact, it has been by far our most popular ship model. Heretofore, however, everyone has had to spend hours shopping for the necessary materials, some of which are hard to obtain even in the larger cities, and the cost, naturally, has been high. A coupon is given below, but if you do not wish to cut the magazine, you may order by writing a separate letter.

Popular Science Homecraft Guild,
381 Fourth Avenue, New York, N. Y.
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#### THE 1 INGRAM BARBERS - TERRY TUBE OR JERRY JAR

The grand old Greek who lived in a tub ever tried Ingram's he'd have founded the Getta Betta Shave Society and acknowledged that here was the one best shaving cream!

For Ingram's is honey to the cheek and death to the whiskers, It's

#### cool! Cool!! COOL!!!

-as the snows of Olympus!

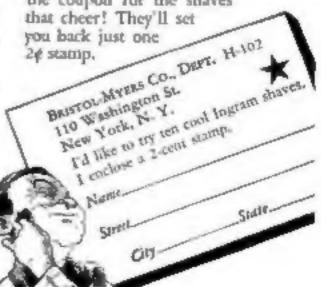
Ingram's is packaged in the handysqueezing tube and the economical old blue jat. Both are crammed to the cap with the coolest shaving soap that ever soothed a cheek and softened a whisker!

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#### TOBACCO FLAVOR NEVER VARIES IN 16 YEARS

#### Smoker calls it "Only blend I never tire of"

MANY a pipe smoker spends years in his search for the "perfect" tobacco. Once discovered, however, will that tobacco remain uniformly the same, package after package, year after year? That is what every pipe smoker wants to know, and that is why it is good news when R. K. Wheeler of Dayton, Ohio, writes that in 16 years "I have never purchased a single package of Edgeworth whose flavor and aroma differed in the least from another." His complete letter will interest smokers.

> 1017 Shakespere Ave. Dayton, Ohio March 4, 1932

Lucus & Bro. Co., Richmond, Va.

Gentlemen:

I have noticed for some time the various letters published by you from users of Edgeworth, and I felt impelled to add my "nickel's worth" to the thorus of praise.

I have used Edgeworth exclusively for sixtren years, and the only reason that figure is not larger is that I did not discover Edgeworth sooner.

I have tried many of the different pipe tobaccos on the market, but Edgeworth is the only tobacco I can emoke day after day without (iring of its flavor, Where do you get it? How do you do it? In all these years I have never purchased a single package of Edgeworth whose flavor and groms differed in the least from another.

So I too say, "Keep up the good work," for it would be a sad day for pipe smokers should Edgeworth disappear from the tobacco shops.

Yours truly, R. K. Wheeler

Edgeworth has confirmed thousands in their belief that smoking holds no pleasures equal to the satisfaction of a good pipe and good tobacco.

Would you like to try this Edgeworth blend? Then send your name and address to

Larus & Bro. Co., 110 S. 22d St., Richmond, Va., for a free sample packet of Edgeworth. Or you can buy it in two forms-Edgeworth Ready-Rubbed and Edgeworth Plug Slice. All sizes from 15-rent pocket package to pound humidor tins. Several sizes also



come in vacuum sealed tins.

Pipe smokers and their families will enjoy the Edgeworth Radio Program. Make it a point next Wednesday evening from 10 to 10:30 (E. S. T.) to listen to "The Corn Cob Pipe Club of Virginia." It is broadcast over a coast-to-coast network of the National Broadcasting Company.

## IS MY Insurance SAFE

By LEON MEADOW, Financial Editor

ET the women play bridge. It's a darn sight cooler out here," said Jack Kennedy, tipping back his chair and putting his feet on the porch

"You're right," came a voice from the dark, where the glow of a cigar was the only indication that someone was actually there. It was Ted Jackson. "And besides," he continued, "who can keep his mind on bridge these days? I can't-too much to think about."

Frank Quinn, quiet up till this point, joined the conversation. "Just thinking about it won't do you much good," he said.

"What's on your mind, Ted?" asked

Kennedy.

"Well, here I've put in two years reconciling myself to changing conditions, adjusting myself to new standards and all that. Now I reach the point where I've decided I can account for the worst that may happen and am willing to take it as it comes. In other words, I'm ready to stand pat on what's gone before in the way of losses, and to start out above. What happens? Several large life insurance companies start to cut their dividends. No matter how bad things have been, I've always believed that my life insurance would be safe—nothing could disturb that. Now, with these dividends cut, I'm beginning to worry about insurance too."

Jack Kennedy interrupted. "I don't know how much you have to worry about. Ted-but, if I were you, I wouldn't go out of my way to pick up additional worries. Anyway, I think I can eruse this bugaboo for you without much trouble. Life insurance componies are safe. That is, of

course, all reputable ones."

"YOU know more about these things than we do," put in Frank Quinn, "but I'm like Ted. I need more convincing. All I know is that insurance companies sink most of their income into recutities and mortgages-and no matter how casefully or conservatively they've picked em, they must be in the hole, same as everybody else."

"Well boys," Kennedy answered, "I'm no financial wizard, but I think I do know enough about insurance companies to convince you of their safety. Do you want to be convinced?". Both men said they did, so Kennedy continued:

"I'll answer Frank first. That seems the best way to start. About 35% of all

insurance companies' assets are in domestic stocks and bonds-mostly bonds-and about 2 or 3% in foreign securities. Almost 40% are in mortgages. On the face of it, then, it would seem that insurance companies have taken a pretty bad licking. But the peculiar part of it is that the ups and downs of the security and real estate markets have far less to do with the affairs of a life insurance company then most people think,"
"How so, Jack?" interrupted Ted Jack-

THINK the best way to prove that is by a simple comparison between an insurance company and a commercial bank. There's one tremendous difference, you know, between these two organizations, and that difference is one of the factors that make the insurance company so safe. Banks must keep their assets in a 'liquid' condition, because it is quite possible that at any given moment they will be called upon to pay out a great part, or even all, of their deposits. The sad experiences of the last two years have taught us how easily that can happen. Because of this condition, the state of the security and real estate market at any given time is of vital importance to a bank. If it's forced to liquidate in bad times, you have trouble-and plenty of

"On the other hand, the assets of an insurance company are not subject to such bazards. They never experience runs, panics or public hysteria. It's very simple. An insurance company writes a policy for a man-and on the average, its debt to him is not payable for fifteen or twenty years, A bank takes a deposit from a man, invests it, and the next day he turns up for his money. There's a vast difference there. The insurance company does not depend on market fluctuations because its assets do not have to be liquidated on short notice. Investments made by insurance companies are long-term affairs, bearing definite interest till a definite maturity date. Fluctuations between the dates of purchase and maturity don't mean anything. Even the law recognizes this and allows the life insurance companies to value their bonds on an amortization basis -which means at a value consistent with their purchase price."

"That's very true, Jack," Quinn said. "Hadn't thought about it from that angle

#### IS MY INSURANCE SAFE?

(Continued from page 6)

before. But insurance companies must sustain some losses in income in times like these, I mean stock dividends have been cut tremendously and there have been so many defaults on bonds and mortgages."

"Right enough," Kennedy replied, "there has been some decrease in interest carnings, and this is the chief reason for these dividend cuts. But do you know that if every cent of lacome from investments in stocks and bonds and mortgages had been cut uff in 1931, insurance companies would still have had enough coming in in premiums to pay out all demands for the year? The other day I was talking to a man representing a fairly large company. He showed me the balnuce sheet for 1931. Company took in \$36,000,000 in premiums and paid out something like \$24,000,000 in matured policies, in face value on deaths-and in policy loans. And what's more, that last item of policy loans can't really be considered as money paid out-but as an investment-and certainly the safest of them all."

"HOW do you make that out?" asked

"Like this, Ted-a man borrows on the full loan value of his policy. If he pays his 6's interest-well and good. If he doesn't pay it, the charge is automatically deducted from the remaining equity in the policy. If he never pays it-the final reckoning comes at the time of his death, when it will be found that, sadly enough, there is a difference between what his beneficiary should get-and does get."

"I give in," interrupted Frank, with a short laugh. "That certainly seems to be enough of a safety factor for any one."

"It should be," answered Kennedy, paus-ing to light a cigarette. "But in case it isn't," he continued, "there are still a number of other factors that combine to make your insurance even safer. Let's go back to the remark which started this whole discussion-dividend cuts. If an insurance company should cut out their dividend entirely for one year, they could conserve about 15% of their premium income. Think that over for a minute. It means that even if their investments go sour, even if their policy lapses are tre-mendous and even if they must pay out an unusually large amount on death claims or matured policies, there is still this way of conserving their income. For what purpose? To preserve their guarantee to you -in event of your death-to pay the full amount of your policy. Wouldn't you take a dividend cut to insure that? Good Lord," he added vehemently, "how many people in this country would gladly have accepted dividend cuts on their stock investments-if it meant protecting the face value of them? How many people have taken dividend cuts and still lost every cent they put into them?"

The men remained silent for a few minutes; each was absorbed in his own thoughts. Then Frank Quinn said, "Talking about death claims and matured policies, have (Cantinued on bace 8)

## HOW YOU CAN # - 3, # - 3, # - 3, # - 3, # - 3, # - 3, # - 3, # - 3, # - 3, # - 3, # - 3, # - 3, # - 3, # - 3, # - 3, # - 3 ON AN INCOME



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City and State ... Business Connection

#### (Continued from page 7)

IS MY INSURANCE SAFE?

insurance companies any way of telling or judging approximately how much they will have to pay out in a year?"

"Yes, they have," replied Kennedy. "They can forecast these things with close approximation by means of their mortality tables. Incidentally, that brings up another safety factor in favor of life insurance companies. In this country the death rate for the public at large is higher than that of life insurance policy holders. One reason for this is the medical selection and acceptance of people who are likely to have long lives. The unfit are rejected. Consequently the actual number of death claims on which a company pays out during a year runs lower than their expected mortality, according to the tables, And the rates, you know, are governed by these tables. This means an annual savings to policy holders—and part of it is returned in dividends, the rest being invested in surplus."

"You certainly are piling up evidence for your case, Jack," Ted Jackson said. "I'm beginning to feel much safer about the situation. Anything else you add will just about clinch the argument."

"Well," his host replied, with a smile, "I haven't finished yet-if that's what you mean! Another safety factor with life insurance companies is their practice of using a conservative rate of interest in their premium calculations. Although they have for years carned about 5%, they have used only 3 or 31/2%.

"NOW, let's return to this question of capital investment. Certainly the depression has bit the investments of insurence companies, as well as every one else's. About 10% of their money is in farm mortgages. The farmer has been hit hard. Yet, I have seen figures showing that 75% of these mortgages, even today, are returning interest payments. Insurance companies rarely loan on more than 50% of the appraised value of property, So, even if they have to foreclose on 20 or 25% of farm property mortgages—the equity is certainly large enough to make those frozen assets worthwhile to the company when they thaw out in good times. The best part about it, as I said before, is that they don't have to liquidate. Insurance companies can sit tight in bad times-and wait for better days. As far as other mortgages are concerned, the great majority of them are in personal homes -and not in office buildings and hotels. where rental incomes have been badly reduced. So that the same condition holds true for this type of mortgage.

"All right, Jack, but what's happened to their bond holdings?" asked Frank

"I was coming to that," Kennedy replied. "About one fifth of them are in U. S., Canadian, Municipal and other Government Bonds, Insurance Companies have invested comparatively little in bonds of other foreign countries. The greatest part of the remainder are in railroad and utility issues. But that's not as much cause for alarm as you (Continued on page 9)

#### IS MY INSURANCE SAFE?

(Continued from page 8)

would think. In the case of railroads insurance company hadings are comprised mostly of underlying issues or virtual mortgages on main routes of travel—ones that would suffer but little, even in the event of receivership. Practically the same thing is true of their public utility holdings which are not the ordinary run of bonds of holding companies, but are actually liens on power plants and companies.

"All these investments, regardless of market prices, are essentially and fundamentally sound, gilt-edge holdings. They will come back to par, And since insurance companies can hold on and do not have to liquidate, their assets are practically

100% safe."

At this point Jack's wife, Martha, stuck her head out of the purch door and made a poor attempt to glare at the men, "Are you fellows going to continue setting the nation's affairs," she said, "or are you going to be sensible enough to come in and have some refreshments while they last? I've been cailing you for the last five minutes."

"Coming now, Martha," Jack answered. The men got up, and, as they were going insue, Kennedy added, "By way of final proof, stick this in your paper and smoke it. In the last fifty years, no reputable and important life insurance company in

the United States has fased."

#### To Help You Get Ahead

THE booklets I seed below will help every family in laying out a financial plan. They will be sent on request.

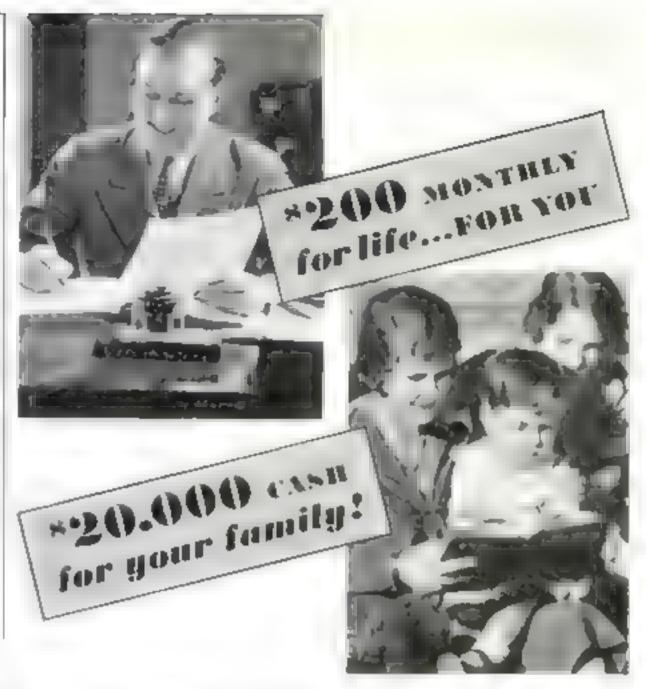
The Investment Aspect of Life Insurance, by M. A. Linton, presents life insurance as an exceedingly worth-while investment as well as a form of protection. Provident Mutual Life Insurance Company of Philadel phia, Pennsylvania, will mail a companion-tary copy upon request.

Before 65 and After explains the full details of a Retirement Income, with full Life Insurance, Disability and Double Accident benefits. Sent on request by The Equitable Life Assurance Society, 593 Seventh Avenue, New York City

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# Our Readers Cay Just Think of It! Another Publication Is Wanted Allow me to make a suggestion and let

Allow me to make a suggestion and let us see what other readers have to my about it. I move that instead of modifying your magazine in any way you publish a substitutely

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#### Glass Goblet, Not Ear Drum, Shattered by Singer

It mas been said that Caruso would sing into a giam gobiet, the tone which the gobiet possessed and the goulet would full to pieces. Dr. Abrams believed that he could change the conditions of discused t wor by applying to the thrue a rate of vibration similar to that of the thous affected. Recently Dr Leibe A. Chambers and Prof. Newton Gams of Texas Christian University, perfected an as paratus that would kill eighty percent of all bacteria present in samples of milk. In putting different mixtures of potentied medicine into a glass gobiet I have had the experience of baving them fall to pieces on the table. The reason is probably because the native vibration of the mass, due to the constant movement of the atoms within R. produce an individual set of emanations that travel on their own plane. When a forced set of similar vibrations meet the mass vibrations there is an explosion.—CEM., Senttle, Wash

#### Nudset Colonies Might Gain Another Good Member

As to J.W.L.'s contention that the artificial production of diamonds will not prove of commercial value, we will not artice. One

thing that appears obvious, however, is that J W L, does not appreciate what science and scientific research have produced blight I suggest that he go about his data routine we bout using anything produced by science. Soon, I am sure, he will change



his mind and be glad to wear comfortable clothes, ride to work in a car, and sleep in a soft bed at night. And est something properly rooked.- R W. M., Harrisburg, Pa

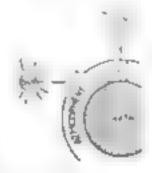
#### Magazine, Not Newspaper, Wanted by This Reader

I HAVE been a very ardent reader of your magazine since 1974 and this is the first suggestion I have to make Let us have a few more pages devoted to radio circuits and diagrams. A ter reading "Our Readers has I have this answer to make to C.E.G. of S. Fernando, Argentina, regarding the paragraph asking for "World Finance News" and "High ter Education in U.S." Anyone dearing such reading material, is reading the wrong magazine. This is a mechanical and industrial magazine. Don't turn this popular magazine into a newspaper.—K.B., St. Paul, Minn.

#### Pertinent Facts to Oust Fanciful Astronomy

I smouth like to take up a little space in reply to the letter of J V.L. of Evansville, and If for any reason the star A, which is one light year distant from the earth, were obliterated we would not know it until one year after the occurrence. The fact that it is one light year distant states that it takes light one year to reach us from the star. As a mater ist act, the nearest star is some six light scars distant. Light does not travel instantaneously its versus is in air is 180,285 miles per second as described by Michelson in 1924 at

Mt Wasse Cantonna, with an error of not more than ten indesper second. As to the absence of stars at the borsers proving the vacuum that is all hunk. The greatly decreased number of stars at the horizon is due mainly to the fact that the clouds and dust in our atmos-



phere obscure them. Looking at the horizon one looks through the thickest and densest part of our atmosphere and there are in variably clouds and dust present. If one were to look at the sky in the late fall, one would see the Malky Way very hear the horizon at about the North and South points. Where then does the statement that "the absence of stars at the horizon acroes to prove that spare is a vacuum" come in? If J.V.L. would like to know a little more about the stars, I would refer him to A Beginners. Star Book," by McKready,—H.A.R., Coleman, Can

#### ice to Water Question Brings This Answer

W M G., Port Washington, N. Y. asked about ice and water at zero, Centigrade. It requires eighty calories of heat to change one gram of ice at zero to one gram of water at zero C. So if you have one gram of water at 0° C. you must take away eighty calories of heat to change it to ice at 0° C and vice versa. Since you add or subtract heat it is not perpetual motion. Can anyone tell me

what a photon is? It is something that has never been found in parts. It is always whole Dr. R. A. Millakan says that it is proof that matter is building up in outer space. Now then what is h? I should also like to know where your artist found the five leased microbe he pictured. His pictures are all right, but I wish he would be accurate.—RRF., Noble, Pa

#### Flying Chinamen Just Flapped Their Wings

THERE'S an old, old legend, or something, to the effect that centuries ago the Chinese flew on flapping, man-powered wings. The

report doesn't say they ever got very high or very far and it makes no mention of what happened to the flyers. Pienty, most likely Now you tell us sea guils are going to give men the secret of flight on personal wings. Oh, yeah? The outler is quite



a bird with a wing spread enormous in proport in to its weight. Take a human bird and give him a wing spread in the same proportion and then fixure out the muscular development necessary to run those wings and you'll get something. Why not talk sense once in a white and admit that man is a machine-using menkey and pitiful when robbed of all artificial means of attack and defense?—L. D.T., Larchmont, N. \

#### Our Knockers Give This Florida Reader a Pain

I am a steady reader of Popular Schere Monthly and I think there is no other magazine like it. I agree with W.T.C. of Mushogee, Okla., knockers give me a pain I have all my copies of Popular Schere in my warshole. The covers are wearing out because I now at them so often. I have a hard time waiting for the next one to come and when it does come my family won't hear a word from me until I have read it from cover to cover—R.C.W., Jacksonville, Fla.

#### His Morning-Glories, Like Some People, Always Seek the Sun

I am having trouble with my morningglories. If I were a scientist, as many of "Our Readers" are, I could tell what is

wrong. I trued to make them climb from the left side of the wire around to the right, and arranged them like that; but they unwound themselves immediately, so I ned one in that position, and it twisted itself in two, and put out a new tendra,



and began to distab from the right side of the wire back around to the left. So I dug into

my botanical knowledge, and reasoned that they were following a natural law of pointing to the sun. "Our Readers" must tell me if I am right.—J.C.B., Pocasset, Okia.

#### Even The Grecian Bend Yields to Old Man River's Curves

Is a recent issue, you named the Nolin River as America's most crooked stream. The is not literally true. The Mesissoppi River should be given that designation if the distance traveled by water and land is to be used.

as a gage. At New Maded (Mo.) Bend, one travels forty-two miles around the bend, when from the head of the bend across the neck of land to Toptonville is only two and three fourth moles. Above and below Arkanaus City Ark., are other bends equally large, though



the neck of the bend is not so narrow. Lake Village, Ark., formerly at the bead of a large bend on the blusissippi, is now some thirty miles inland, situated on a half moon shaped lake formed when the river cut through the neck of the bend during high water. There are several other bends in Louisiana that are very similar in proportions to those cited. At Great Bend, Kans., is another rival of the Nolan River. A series of bends on the upper Missouri River cause the traveler to take his boat sixty-two miles around, but he can stand on a slight bill and look across to the foot of the bend only eight miles away —C.C.W., Rockford, III.

#### Here's a New Way to Get Real Law Enforcement

I staye been a reader of Populan Science MUSTRLY for several years but have taken no part in criticism or suggestion in regard to your articles for as a whole your magazine just stats me and I have been content to leave we enough some to Lean't help making a e principle on the arrived to Mr. Texte in a re- of the first art of the new prisings as tone's. Let us have more articles lithe give us have to note in vestas to what this crime wave is actuary costing each individual. I am sure if we can get enough publicity on this subject the honest people will rise in revolt when they find out what it is costing them. Most of your readers seem to have sound minds and I think seed sown here would fall upon fertile ground. I know the average man, not connected with a law enforcement branch, does not realize what It means or what it is costing him or he would have been up in arms long a c J W.C., Chillicothe, Ohio.

#### You Spray That Water to Run That Car

I am writing you with reference to a problem that I have been wondering about for six months or more. The problem is this Why can't motors be but I similar to Diesel engines and made to run on water? My

theory is that instead of spraying fact of the bot, highly compressed air in the cylinder, you inject a quantity of water. It seems to me this water would instantly change ito live steam and create enough power to run the motor Probably there same thing wrong with this



idea. Otherwise someone would have tried it long ago.-V.E.J., Pasadena, Calif.

#### Oh, Feet and Feet and Feet at Least-Maube More

Have some to exercise your intensity on: A certain rectainear field was of such proportions, that the length was to the breadth, as the diagonal was to the length. If the breadth was 100 feet, how many square feet did the field contain? This isn't really more than half as difficult as it looks.—C.A.P., Monrovia. Calif

#### Government Will Analyze Fake Cure-Alls for You

Answeating the letter from FAW, Miami, Fla. I work at a place to which the Government sends a circular about condemned articles that are supposed to cure all kinds of pains, aches, and aickness. If you will be kind abough to get a bottle of one of these fakes, you would not only belp yourself but many others by just sending it to the following address where it will be analyzed and if it does not contain the said ingredients it will be taken off the market. Send the bottle to United States Department of Agriculture, Washington, D. C.—W. C.K., Hempstead, N. Y.

#### Jove's Thunderbolts Get a Quite Modern Setting

Man made behining leaped a thirty-foot gap, your splended magazine tells us. Could have been usty, had there been room, you add. Why only sixty? Why not six hundred? Or six thousand? What's the limit to voltage?

classed it occurred to anyone but me that here is a mighty weapon of war? A thousand yard lightning hold could wise out a manager a local regimenta, or how many you got? Remember the legend of Jove's thunderbolts and the fire used to destroy distant enemy



whips in the dim past of Greece's history? Maybe that wasn't all legend but merely the expiring flourish of a dying Atlantia civilization. I'll but that neither you por anyone the can prove I'm wrong.—M.J.H., Flextwoor.

#### Why Your Fish Would Weigh What It Weight and When

ANSWERING the problem of L.W.R., Monroe, Mich., concerning some poor fishes. A fish weight less to water than out because water, being heavier than air, it displaces more of its wright in water. If the air of gas in the bladder didn't weigh anything, how do you suppose the fish could contract the darn thing to make houself heavier? The fish if not actually heavier, in weight, is heavier in comparison to its two stars which increase and decrease with the expansion and contraction of the bladder. Now if the air or gas weighed nothing, by contracting it he'd have a space full of nothing that would weigh something, or some such thing. The fish that you killed and the fish that you let sufforate would weigh the same in open air But if they were weighed in a vacuum, the fish you killed would weigh the more, as it would still have air in it, while the one that you sufficiented would have gradually lost all air.-TPS, New York, N. Y.

#### Anthropology Is His Long Suit and He Likes Fatt Cars, Too

As a contribution to your "Our Readers Say" pages, I should like to say that I like your articles on archaeology and anthropology, etc., the best, and wish you would have more of them and less on radio and insignificant inventions. I like to read about racing

cars and fast commercial cars, too, and enjoy the articles you have on these subjects. It's a good magazine though, after all.—J.R.T., Tustin, Calif.

#### Somebody Surely Is Bugs —And It May Be We

) out article on electric hotheds gave me an idea—honest. As it's too good to keep to myself, here it is. Get those laboratory fellows to figure out a way of transforming radio waves into heat energy. Then big central

stations could broadcast heat hightning to the farmers and garden truck chaps with a resulting enormous increase in output. Think of the starving people who could be fed. Think of the low prices that would still yield a profit. Think of the agramble back to the farm lands



Well, just think, Who's bugs now?-PE.T., Hartlord, Conn.

#### Gas, Not Dynamite, Is Blamed for Explosion

Referenced to your article in a recent Issue on How Bomb Steaths Trap Pascappie Murderers," I would my that I believe your photograph of the wrecked automobile is at variance with the description given. I believe this explosion was not caused by dynamite, but that it was an explosion of a gas tank, As you probably know, dynamite is a "high explusive." Its action is so rapid that the force is expended equally in all directions If you lay a stick of dynamite on top of a rock, with no cover, and explode it there, the sock is shattered. Hang it on any side of the rock, but of course against the rock, and the same thing occurs when it explodes the rock is shattered. A mixture of gasoline vapor or fumes toured with from 2% to 5% of air makes an explosive only alightly less powerful than dynamite. It has the explosive effect of black powder as the force of the explosion is expended in the direction of least resistance. The force of the explosion that wrecked the car you showed was expended upward, and this gives it the earmarks of a gas tank explosion. One thing that is not generally known is that a charge of dynamic powerful enough to throw a 150 pound man upward through the top of an automobile would, literally, tear him into shreds, It is hard to explain to the general public that these things can happen. The very name dynamide has a fearsome effect on most persons, and juries would rather say that an explosion such as depicted was the effect of dynamite than to let on that it could be caused by gasoline.-C G W., Rockford, Ill.

#### Wouldn't We Look Sweet as a "Fashion Magazine"?

I agree with F.A.S., Darien, Wisc., that you probably are addle-headed by now. What next? A woman's page in a mechanical

magazine I suggest you leave Portuan Science Montain as it is except you might add a little more chemistry. Also I should like to suggest to FAS, that she get some (ashon magazines along with a couple of medical journals, Let's have more experiments. Some one come on



with the solution that is used to treat gas mantles. I wish to experiment some with this.—J.H.T., Oklahoma City, Okla.

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P5-10



# High-Flying Planes POISED TO Race SUN across Atlantic

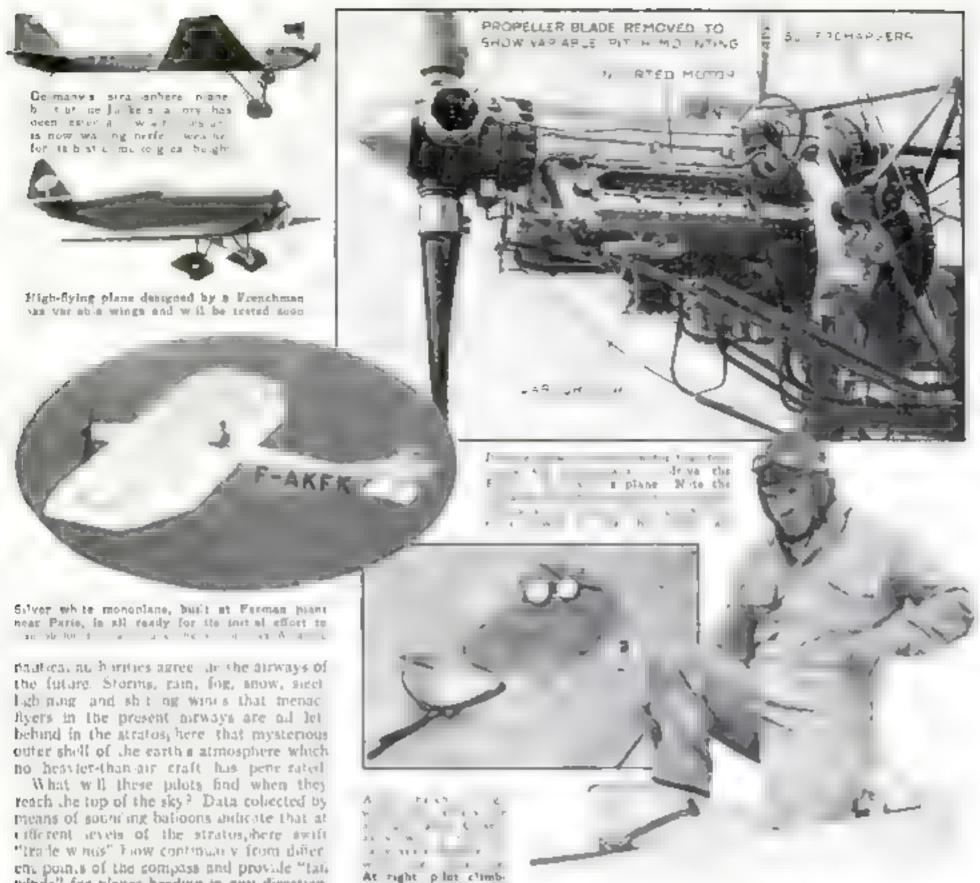
By EDWIN TEALE

ARRYING within its fusuage an air tight cabin shaped like a metal capsule, a silver-whi e mono plane sourced into the air near Paris, France, a few days ago. Built secretly behind locked doors at the Farman plant it is the latest entrant in an international race to conquer the stratosphere—the thin air ten miles above the surface of the earth.

Shortly before that, workmen at the Junkers' factory, Dessau, Germany, had completed a strange machine with a slender body and an enormous seventeen-foot propeller, also designed to fly in the stratosphere. Its preliminary, low-altitude tests completed, it is now poised waiting perfect weather for its first dash to the upper levels of the sky

A third machine, a buge monoplane with wings of variable area designed by the French engineer M. Guerchais, is receiving its finishing touches as this is written. This craft, its inventor predicts, will be able to climb to an attitude of ten miles in forty minutes.

Within the next few weeks, one or more of these planes may blaze a trail into the carefied air above the 50,000 fout level. In this region of bitter cold and steady winds, aero-



ing from cabin through

machine a open hatch

than one-eighth that of sea level and where no breathing thing can exist because of insufficient oxygen.

When spectators crowded around the Junkers and Farman places on their first appearance, the feature that interested them most was the air-tight metal cabin designed to protect the pilot

against these dangers.

On the Farman, the cabin is a duralismin cylinder seven feet long and three feet in diameter, shaped like a capsule. You enter from the top of the fuseinge through a round "coming tower" and descend into what seems to be a miniature submarine. Two seats, one in front of the other, are fitted with dual controls. Electric bulbs light the interior, for the only openings that permit suplight to enter, or the pilots to look out, are small portholes, one on either side of the cabin. Just outside the left porthole, a streamlined case on a wing strut holds the dials of twenty instruments for making observations during trips to the stratosobere

At the start of a flight, one pilot crawls forward and takes his place in the leading seat. The other, perched high on the back of the fusciage where he has a clear view in all directions, guides the plane into the air, using a small demountable control stick and auxiliary rudder pedals. At ten or fifteen thousand feet, he signals the other pilot in the "blind" cabin below who takes control, flying by instruments. Then the "take-off" pilot, who also lands the plane, clambers down, (Continued on page 96)

winds" for planes heading in any direction. Miles above the highest clouds, the "thinair sh.ps" will race through clear air, aided by favoring winds and uniform weather

Guiding his machine from an air-light cab in the most will navigate by stars, but shore day and night, in a blue-black sky. We see the stars disappear and the sky turn light blue in daytime because we look upward through a haze of reflected sunlight. In the stratosphere, above this base, the sky is niways black, the stars shine continually, and the sun gives

off the barsh glare of a searchlight.

Favoring winds and the thinness of the air will make possible tremendous speeds. Engineers predict the Farman plane may rush beneath the jet black sky at 400 miles an hour; favoring winds may add another 100 miles. Such speeds would being Paris within eight hours of New York and make possible a round trip between America and Europe in less than twentyfour hours. At the latitude of Paris, a place going 500 miles an hour could circle the world in a single day,

Because this is true, the first pilot to head westward from the French capital at 500 miles an hour literally will race with the sun. Because he will be going fast enough to circle the earth in twenty-four hours, he will remain in a fixed position in relation to the sun while the earth is spinning beneath him. If the Farman plane heads west at that pece, its pilot, Lucien Coupet, will be the first man since Joshua to see the sun stand still in the sky!

However, the thinness of the upper air which makes such tremendous speeds possible also accounts for some of the greatest difficulties the designers of high-flying planes had to overcome. Stratosphere ships will fly at a height where the pressure is less



#### ELECTRIC ORGAN PRODUCES NEW TONES



MUSICAL tones different in timbre from those of any other sustrument come from a new electric organ The inventor Ivan I. Eremeeff Russian engineer fiving in Philadelphia, Pa., calls it a "gnome instrument Outwardly it consists of a keyboard on a pedestal with immovable keys of stainess metal. The performer sais ution a stool covered with Japanned metal and pulys the instrument by touching his fingers to the keys. This contact forms a circuit between the electric ady-wired stool and keys, and causes the tones to be sounded. Within the instrument are whirling disks, one for each tone, operated by an electric motor in the base. When the performer touches any key, the corresponding disk magnetically actuates a radiolika circuit that amplifies the tone.



#### BLADE ON TINY NEW SAW EXTENDS FIVE INCHES

UNUSUAL in design is a tiny saw that can be used for cutting wood and metal in places where it is impossible to employ a larger saw. Detachable blades, clamped in the groove of a rus proof steel holder, can be adjusted to extend five inches beyond the end of the holder. The little saw is designed for keyhole and conduit work.



#### GOLD SPRAYED ON WOOD

EVENING gowns of shimmering platinum, and wood and paper articles coated with gold, are forecast by recent experiments at the California Institute of Technology where the apparatus shown above has been developed to apply these metals. When a piece of the metal and the object to be coased are placed in a vacuum chamber and the first is heated electrically a 'mist of metal is sprayed on the object.

#### ODD ALARM AT

So THAT he could work at the back of his shop and still serve customers stopping for gas, on ingenious garage man constructed the narm device, shown in the photograph at the right, from an old trolley gong, a hammer, a short length of chain, and old trolley ties. When a motorist drives into the position shown by the car in the photo, the lever in the roadway is ite pressed, actuating the gong and summoning the garage man. As soon as the car moves on the gong stops



When a car a driven across the lever in front of this gas attitud, the averm, automatically sounded, calls the salesman

#### RAILROAD USES TOYS TO FIND LOSS DUE TO WIND

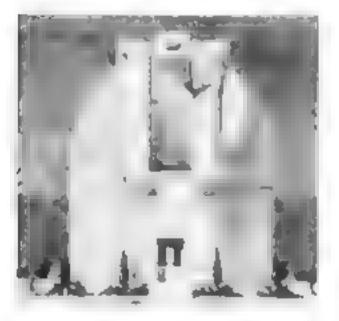
Toy-sized trains were recently taken to n wind tunnel at Teddington, England, to help experimenters learn how to reduce the wind resistance and power consumption of engines and cars. Strung upon a steel bar connected to balances outside the tunnel, a model six-coach train was thus exposed at an angle to the rooming gale of an airplane propeller while the engineers measured the forces striking it from front and side. Modela of individual locomotives were also hung on wires attached to balances, for lests at wind speeds as high as seventy miles an hour. The picture at right shows an experimenter setting up the model of the train in front of the powerful blast from the whirling airplane propeller. The force of the air current is carefully gaged to ensure accuracy of the data.



When the driver of this speedboat fell overboard as be made a first rurn, the craft dashed shead, struck a yacht and drove its sharp provide a color of the first

#### SPEEDBOAT PROW PIERCES YACHT

to the real actured above. The text of the text of the real actured above. The text of the



#### UNUSUAL DOME HOUSES BIG NEW TELESCOPE

A morganistic dome of welded steel will house a photographic telescope now being built for the Naval Observatory at Washington, D. C. Light from nearby lamps will be kept from the terrscope by the collapsible, tubular shade visible at the top.



#### CAFETERIA ON FAST TRAIN

A CAPETERIA for Pullman possengers was installed recently by an English roll way. While the train rushed along the possengers filled their trays in the cafeteria compartment of the Pullman. The success or the cafeteria car is expected to lead to the adoption of the idea on all trains of the system. Photo at right shows car with countergril and barmard

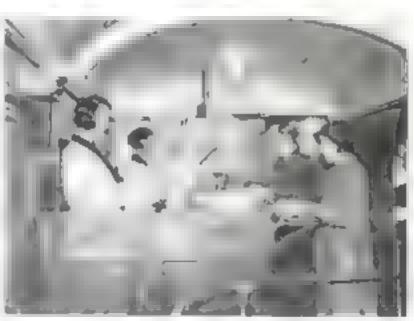




German Mountain Coards practice their life-seving stunts to the Alps

#### CAR'S SEAT-LIKE BUMPER SAVES PEDESTRIAN'S LIFE

When a new safety bumper, invented by an Englishman is attached to the front of a car it is said to be an unity impossible for a motorist to run over a procession. The bumper shaped ake a seat, is padded with spange rubber. If a person is struck, he is knocked into a sitting position and carried a ong on he bumper. The inventor A. J. Grafham of London permitted himself to be run down by a car equipped with his device and escaped without injury.



#### VICTIMS IN ALPS SAVED BY CABLE

How in jured mountain climbers are brought back safely to the hospital was demonstrated recently in thrilling practice maneuvers by the German Mountain Guard. Formed twelve years ago to patrol the German Alps and rescue climbers in distress, this organization saves as many as 400 lives in a single year. Often it is necessary to fashion a cable "rathway" to awing an injured climber across chasms by an aenal route, and the practice exercises train rookie members of the guard in this difficult work

## Jets of Water Cut Plugs of Steel

CLITING steel with water is a feat recently performed by Westinghouse research engineers at East Pittsburgh, Pa. To test the rate at which different metals wear away, the experts screwed two quarter-inch plugs into the rim of a

wheel that whirled them 20,000 times a minute, or more than 300 times a secondthrough two jets of water the size of a lead pencil. In less than three minutes, the water had eroded plugs of stainless from and nickelsteel balfway through. Iron mitride, almost diamond hard, could withstand thus ordeal. by water" for only fifteen to twenty minuses before the jets cut half through the plug. The test revealed the wearing qualitres of turbine blades and of airplane propellers whirling at tremendous speeds in rain. As a result of these experiments efforth will be made to develop an alloy capuble of withstanding for a longer time that destructive action of the water through which it may be driven at high speed,



Breel plugs set in a m of wheel gre whered through tee of water at 20,000 revolutions ner minute At 1 ght view or plugs out searly in two by the water

#### HOME SPRINKLER SOUNDS FIRE ALARM

A MINIATURE sprinkler system to protect private dwellings from fire has just been perfected and placed on the market. Though it resembles the larger outfits that guard office and industrial buildings, each part has been especially adapted for domestic use. The new apparatus is installed in the

cellar of a home, where statistics show a large percentage of fires start. It is connected to the household water supply. When slames raise the air temperature to 135 degrees, the nearest sprinker head opens and pours water on the blase. At the same time, it fings an electric alarm bell.

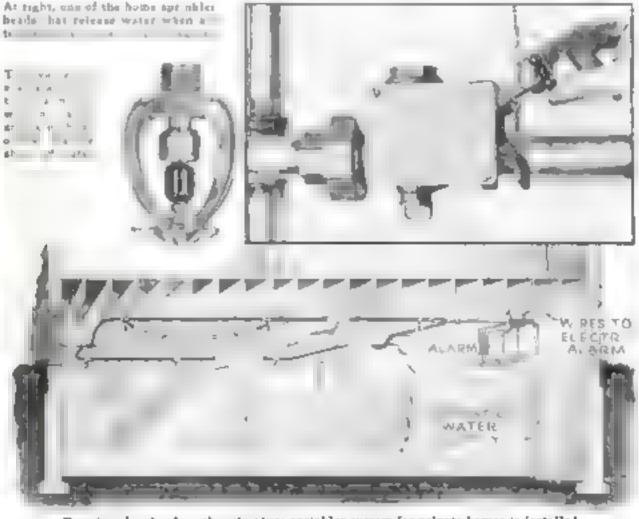
#### SHOVEL, PICK AND HOE COMBINED IN ONE TOOL

Showet, pick and hoe are combined in a new tool designed by a San Francisco inventor and shown in the photograph. The implement may be adjusted for the desired use and locked securely in place within five seconds. According to the inventor, it should prove especially useful to gardeners



#### SAFETY WHEEL FOR CAR ENDS BLOWOUT WRECKS

DELIBERATELY wrecking a tire by driving over large bolts and nuts, a Pittsburgh, Pa., inventor recently demonstrated his new "safety wheel" to prevent a driver from losing control after a blowout. The car's weight drops on a metal disk faced with solid rubber attached to the wheel



Drawing abowing how the ministure sprinkler system for private homes is installed

#### Asbestos Shield Protects Firemen

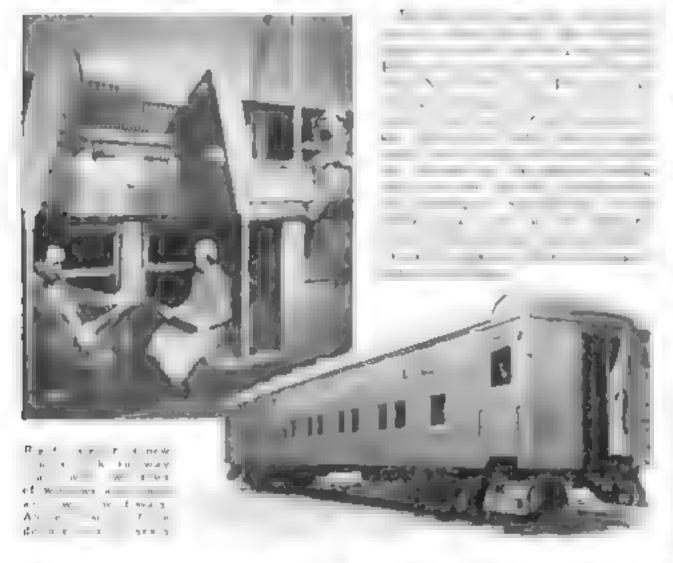
Below ashestos umbreila with openang for hose used to protect firemen near blaze At left drawing tog ni besu as all orders wed awods ting close to burning structure. At for eft. ambrella to ded for carrying

UMURELLAR OF aspestos are the latest German aid to fire-fighting Every member of a fire brigade in a provincial city of Germany was equipped recently. with one of these

new implements. When open, it shields him from the wost intense heat so that he can play his hose on the blaze at close range. An aperture is provided in the umbrela, for this purpose. For earrying and

storage, the device is quickly folded. The idea for this invention is said to have been taken from asbestos screens employed by sprayers of biguid free in the world war-

#### RAILWAY INSTALLS TWO-STORY CARS





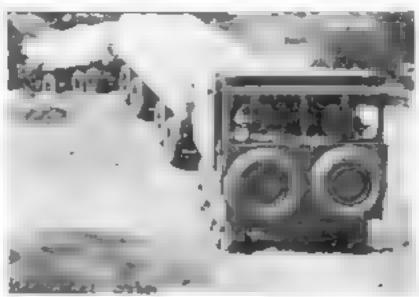
#### MACHINE TEACHES FAST WORK AT TYPEWRITER

To sette typewriting students to greater speed, a Portland, Ore., high school instructor devised the practice machine shown above. A series of words passes contimiously across a window at the front of the carmet. The student is required to copy them. A second a delay and the words are past the window and permanently lost to view. Turning a knob slows down the procession of words, and the dial may be set and locked by the instructor at any speed from ten to 120 words per minute

#### LETTERS MARK CEMENT

LETTERS of aluminam, with fingerholds on the back. are now used to print agns in rement. Pressed down into the wetcement, they form Indented words Used with a straight edge the aluminum stamps produce clear-cut lettering

with a minimum of effort and of time, according to the manufacturer



#### MOVE FREIGHT IN TRAILERS

A current s train of trailers, pulsed by a three-ton truck "engine," passed recent tests in England Roll ing along on twenty-four balloon tires, the three trailers, each carrying 6fteen tons of freight, followed the pulling truck in a thrilling demonstration The train is designed for bauling freight in the tropics and Far East

## Help Yourself to a HOME



Uncle Sam Still Has Millions
of Acres of Land Waiting for
Settlers and Thousands Are
Now Filing on Western Farms

By ANDREW R. BOONE

Easte Wynn, once a jeweler in new a confirmed homesteader living on his 160-acre form th southern California and busy raising offeils

IX shallow water with reasonably suitable soil and add \$250 in small installments. There you have a successful homesteader a formula for the acquirement of a home of Government land yet available to the American public.

Today thousands of people are turning to the public lands, establishing the homes they long have wanted and finding in the wide open spaces of southwestern deserts and northwestern prairies and in western mountains the freedom of which

they dream

Before the current economic unpleasantness the general land office at Washington received some fifty inquiries a day from persons interested in getting a piece of Uncle Sam's land. Now as many as a thousand inquiries are received in a single day.

Esde Wynn, who gave me his formula for successful homesteading, no longer is in created in the struggle for land. He has his; has increased its value from nothing to at least \$40 an acre, for recently he sold a twenty-acre piece at that rate And now he lives comfortably in his \$200 stone home, oversees a helper who raises his alfalfa and vegetables and, as a side-tine, conducts a small store and gasoline pump thirty-two miles from the hearest town in the heart of Borego values in southern Caufornia

Wynn's story is typical. When he first went onto the desert a few years ago after having served two decades behind a jeweler a counter, his automobile could not carry him to the plot he had picked out on a map. He paid a rancher \$12 for the use of four burros to get his belongings to the center of the valley

Wynn slid off one of the little "desert canadies" at the end of a hard day's ride and where he planted has feet be decided to stay. For a year he lived an a tent A discorded auto engine tune this pump and record water that a stored in a reserve runtil the event at the extended

cabin, meablime drill of for water and fencing his plot. When I visited Borego valley recently to learn for the readers of POPULAR SCHNEE MONTHLY from the homesteaders themselves how they have accepted the Government's offer of free homes. I found him swinging his teet from the counter of his tiny store while across the sandy road an automobile engine, bought from a junk dealer for \$5, was turning a \$15 pump (ba). lifted water from two wells into a shallow reservoir to water his alfalfa

I had driven my car thirty-two miles through

a narrow mountain canyon after leaving the paved highway. Roads, little more than hard-packed trails, make it possible today for many homesteaders to take up land where a few years ago they could not easily reach a chosen plot

I met one young fellow with a broken-

#### Where Government Land Still Waits for the Homesteader

California	\$6,046,000	acres
Nevada .	\$1,399.000	H
Utah .	25.157,000	44
Alaska	346.037.591	

#### Small Amounts in:

Idaho, Oregoo, Washington Colorado Montana, Artecha, Arkansas Nel. raska Fierrila, New Mexico, Minnesota South and North Dakota, Mansas

#### Filing Fee:

1	160	acres	\$.61	to	\$22
1	320	4	\$22 1	to	\$34
1	640	a	\$34	to	\$58

down truck halted alongside the narrow trail. After I had offered such help as lay within my power, I inquired about his work. During the day he told me, he drives the truck for a near-by ranch and each evening he turns the nose of his flivyer south to his homestead, seven miles



own 160 pares, with water supplied free

tween villive fact, wel-

His is une of the 63,000 homes caus

now besng taken up.

Large acreage is still available today but in Texas, Georgia, North and South Caronna Tennessee Kentucky Missouri Iowa Banets, Indiana, Obio, the Virginias, Maryland, New Jersey, Pennsyl-Vania New York, Connecticul Rhode Island, Massachusetts, Vermont, New Hampshire, and Maine none can be had

Small amounts can be had in Michigan Wisconsin Kaimas, Oktahoma M ssissippi Alabama, and Louisiana

All but one million acres of the public lands available for homesteading lie in the eleven western states. But how do you

In the first place, there are three general types of homesteads. 160 acres for ordinary farming with water, 320 acres for dry farming, and 640 acres for stock

raising For the first of these you pay a filing fee ranging between \$16 and \$22, depending on the value Uncle Sam places on the land, a fee of \$22 to \$34 unables you to move in on the dry farming plot, while \$34 to \$58 secures the stock raising homestead

When you apply, the land agent in your district will tell you whether the piece you want has been withdrawn for forest or some other purpose If it has been withdrawn he still will forward your appli cation to the General Land Office, Department of Interior, at Washington, since the reason for withdrawal thay have disappeared and you still. may get the land

The Government is generous with homesteaders, once they have been permitted to tile an application, but it is a strict disciplinarian. You can't get a piece if the Secretary

Tynical homestanders descri dweiting boust. The front room is said as a store

of the Interior is convenced you can't

make a living on it; yet, if you are trying

honestly to improve the homestead, the

department will go great lengths to keep

If you lought in any war Uncle Sam

will waive some of the residence requirements, making allowance for the months you spent in uniform. Not only do exsoldiers and the widows of veterans who died in service have preference in claimme homesteads, but they need live on the land during only part of the term. Generally speaking, the veteran must continue his residence and cultivation only for such period as will, when added to the time of his service, equal three years. An

you there

ex-soldier with nineteen mouths of service may fulfill the residence requirements in seven morths.

Most of the 63,000 homesteaders now criecting their titles took up the type

of homestead that requires them to live on the land while improving it. Frank B. Osborne can tell you how to accept the Government's offer of free land, for he and his wife are fust now ready to make final proof that they have lived twentyone months on their 160-acre desert homestead during the last three years and that they have made all the improvements required, besides raising watermelons, to-

matoes, and com-

Three and a half years ago Osborne decided he was (Continued on page 97)

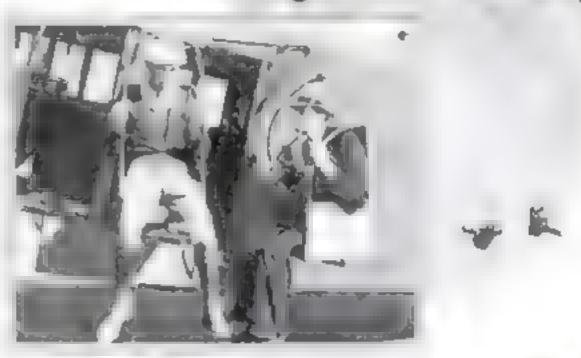


While waiting for oreignted desert find to grow crops, many petters rates flocks of turkeys for the market

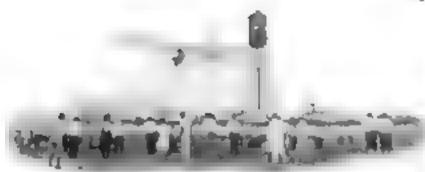
## Latest Developments in

## AVIATION

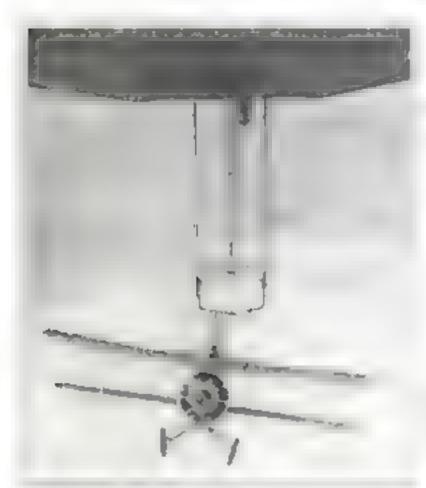




THROWN OUT AT 2,000-FOOT ALTITUDE, When the pilot of a cripp'ed plane works this emergency passenger-dumper, doors doon and state awing out. The next moment passengers start earthward at end of 'thutes as at upper right



BALLOON LIFTS GLIDER Attached to a hot ar balloon, this glider was carried afoir for a sest flight at Autora Di. Culting occo from the be loon, the glider flow at a good take of speed for four minutes, drives only by three emploding rackets



HOOKING TO BIG AIRSHIP. This unusual picture shows a high speed plane grabbing the trapezerite contraption that I find about the Akron. In the background can be seen the wing of a second across that also hooked on



Recent to a classe as frages a day of a classe a

the Grand C. A. s.



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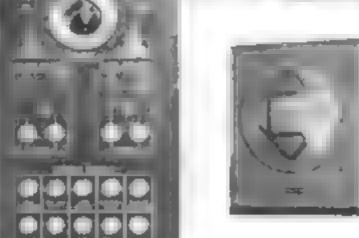


# Robot Hero PREVENTS Prevents Panic

a panic when fire starts in a crowded theater, by ordering the orchestra to play and the audience to file out calmly, so a new "automatic fire hero" plays the same role mechanically. Unlike the human hero, whose presence cannot always be counted upon, this amazing electrical system is constantly ready.

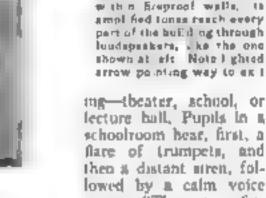
When a sensitive electric wire strung through the building detects fire, it sets the system into action through a central control panel. Green arrows, lighting up in the balls, point the way to exits Meanwhue a phonograph starts. Its amplified tones issue from foudspeakers scattered throughout the building.

Records are suited to the type of build-



rul panel for the mat a fee beto sys

Bwitches behind start loudspeakers while lights in front give locating of fire



ing—theater, achool, or fecture hall, Pupils in a schoolroom hear, first, a flare of trumpets, and then a distant stren, followed by a calm voice saying, "There is a fire emergency but no immediate danger You must leave the bus cing You are drilted in this and know just what to do. Leave your hats and coats, take your piaces in line. Steady now,

Above a phonograph play-

ing band music and sound-

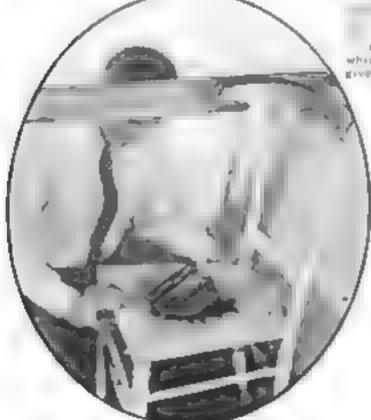
ing fire werning Installed

tion't rush. Follow the green arrows." A brass band strikes up. Through the music are heard approaching strens.

hvery bing in the record is planted for its psychological effect. The music is selected for its marching rhythm. The aren is used to accustom the children to it in drills so that they will not be frightened by the real thing.

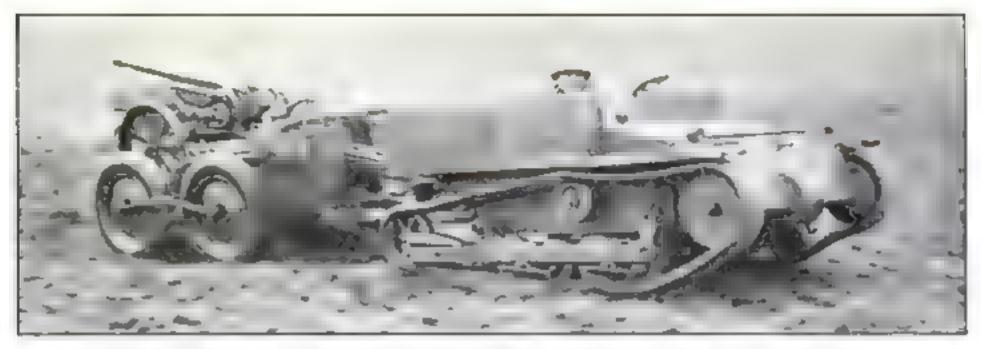
Meanwhile, the fire department is notified automatically by the electric system. Arriving firemen find red arrows in the hall pointing toward the blaze

Numerous installations have been made of the fire-detecting wire. With the addition of the sound apparatus, developed by Western Electric engineers, a real mechanical hero is provided that may be depended upon to prevent a panic





Close up view of special fire-detecting were which is arrung behind moldings. Here melts fusible core which expands, horse away the paraffined insulation, and sets off the alarm. At left, wire, like that been above, detected the five caused by but finterm and sounded the alarm to promptly that no more damage than picture above was done by blaze.



#### BELGIUM'S TANK DESTROYER TOWS GUN ON WHEELS

NEWEST weapon against the formidable tank of army warfare is the "tank destroyer," of which the first recently went into service for the Belgian Army. This

materized unit includes a powerful field gun, mounted on a four-wheeled towing carriage, and a speedy tractor of endlesstread type to whirl it into action. Army experts believe that a fleet of these swift, "destroyers" could set up their mobile artiflery in time to repel a surprise advance of enemy tanks.

#### HYDRANT BREAKS EASILY BUT PREVENTS FLOOD



#### VIBRATING TABS HELP MUSICIAN'S FINGERS

An electric linger exerciser for musicians is the invention of a Portland. Ore., music teacher. When the fingers of either hand are laid upon four metal tabs and the current turned on, a motor vibrates the tabs and exercises the finger muscles. Players of any keyboard instrument are benefited by the treatment, according to the inventor. Their fingers become so supple that difficult musical passages are easy to perform.



At reast glance the chief virtue of a new style of fire hydrant might seem a defect—for it is especially designed to hreak! But the designers have a good reason for their seeming folly. When an and extensive repairs both the hyperant and the pavement surrounding it. The body and connecting the top with the below-ground section, which maps off when

POPHYDRANT

struck a heavy blow. A new ring may be installed in a few minutes. It is even unnecessary to shut off the water pressure, since a self-closing valve in the hydrant inlet prevents flooding.

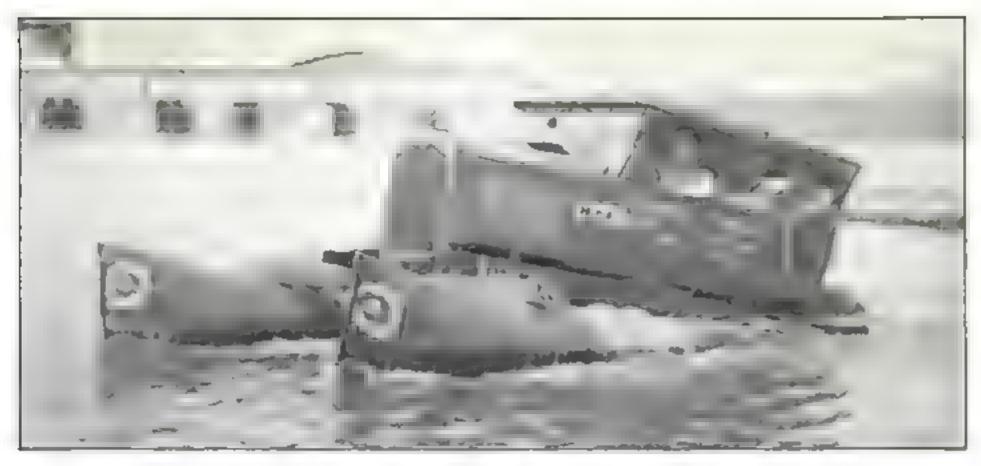
#### HANDY PENCIL HOLDS IODINE

First aid for cuts and wounds is provided by an antiseptic pencil that may be carried in a pocket, handbag, or camping kit. Resembling a fountain pen, it holds a bundred drops of iodine. When the cap is removed and the antiseptic pencil is tapped lightly, a drop of antiseptic falls upon the wound, as shown in the photograph at right. The notate is removable for refilling.



#### CONCRETE ROAD LINES REPLACE PAINT STRIP

White concrete center lines are being built into highways in New Jersey in place of painted strips. The six-inch ribbons of concrete running down the center of the rosos will provide permanent markings—an improvement over painted lines which must be renewed frequently due to ravages of weather and traffic. Thus the concrete marking will prove economical.



#### Taxi on Pontoons Takes Passengers for Fast Joy Ride

By Firting improvised portions to a tiscarded as emobile Isalore Union of Somerville Mass has created what he cold his but water tax. A series of

unnerwater unipellers give the craft a speed of ten macs in hour chrough the smooth with raids the Unites River. The street have use the controls in the same was as on dry land. Though one of the many signs scrawled on he sate warns.

No south No rate Couldn has no detective in tenting passengers.

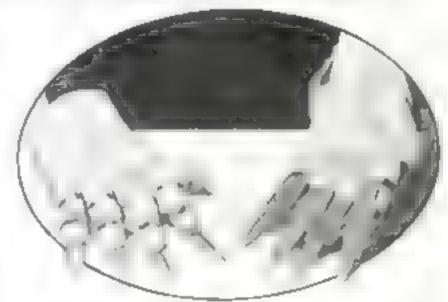
#### ROUND JAW GRIPS PIPE

A LOS ANGELES, Colif., inventor has applied for a patent sh an ingenious hipe wrench. To make it grasp a pine, the handle is twirled, advancing the circular inner jaw. The pivoted outer jaw has sufficient play to bile ic o the pipe when the wrench is turned A chumb lever working aguirst a spring releases the wrench .rom the pipe as shown in the photo.



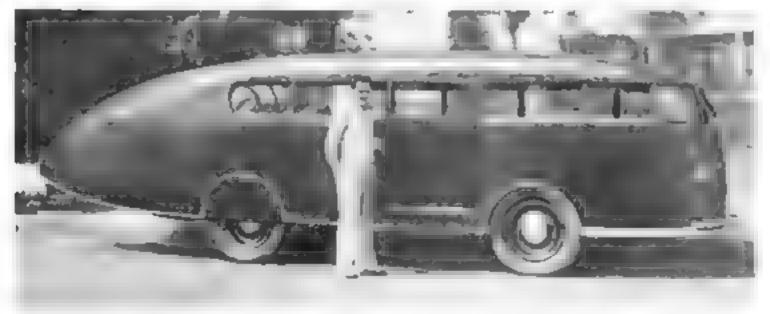
#### CLAWS ON GARDEN GLOVES SAVE HANDS

To MAKE the task of weeding the garden less trying upon the hands, gloves with claws have made their appearance on the market The claws are mounted one on each hogertip and riveted to the fastic of the glove. Their pointed tips speed up the work of removing routlets and weeds from the flower bed or vegetable plot. The gloves appeal especially to women since their use averts threy fingers and sponed manicures



Steel claws are fastened socurely to the fingerious of these garden gloves to speed the work and protect gardener a banks

#### BIG "MYSTERY BULLET" CAR HAS COMFORTS OF HOME



"Mystery bullet" car, stream incd for speed, a home on wheels in which are refrigerator radio balls, and meeping accommodations for four persons, was built by California mechanic

A STREAMLINED house on wheels, called by its builder the 'mystery bullet" car, has been constructed for cross-country jaunta by a Santa Monica, Calif., garage mechanic. Its interior contains bath facilities, davenport and lounge chairs, radio, electric refrigeration, a phonograph, and many other comforts. There are sleeping accommodations for four persons. The body is twenty-four feet long, six feet wide, and has a mammum beight from floor to ceiling of sixtyseven inches

## How Jungle Near Our



Grant hippy shows the keeper bis tech as a pre-immery to some needs disease work

#### By JOHN E. LODGE

WENTY-FIVE million people visit American toos every year stattered from coast to coast ore than 130 too ogical perks contain thousands of rare animals collected from all parts of the world

How are there animals kept in good heath? How are they treated when they get sick? What do they eat? How are the chinates to which they are used reproduced? In fact, what goes on behind the

scenes at a big soo?

Those are frequent que ons in the pareda of visitors who see the nor do on parende. To answer these queries and a bost of others, I recently spent several days at Italian Fark. New York City the 200 that has a many other on earth. Here I learned what takes place when the gates are closed to the public, the way keepers care for rare specimens, how food is brought from far parts of the globe, and what accentific methods are being used to keep the wild creatures in captivity well and happy

At the new reptile house recently opened at Washington, D. C., an elaborate humidifying, ventilating, and heating system has been installed. Thermostatically-controlled electric heaters at the back of every glassfronted cage keep the makes at the temperature that best suits them. This ranges from eighty degrees Fahrenbest for the diamond-back rattlers and cobras to seventy degrees for the bull makes and the spreading adder. Glass roofs permit the sunlight to stream into the cages and when the sky is cloudy, ultra-violet lamps map on, filling them with synthetic sunshine.

A major problem in every soo is supplying the animals, birds, and reptiles with sufficient sunaght. It is almost as important as proper diet. At Bronz Park, a fiftyfoot "sunshine island," circled by a waterfilled most and a concrete wall, has just been added to the equipment. In this sola-

N bran graden greather on a bree officers with the common terms of the common at the common terms of the c

rium, more than 150 nonpouonous reptiles will bask under the open sky during summer morths.

In winter, four big ultra-violet lamps flood the jungle cages in the monkey house with artificial sunshine; 500-watt bulbs supply light and heat for the tropical ligards, and infra-red-ray lamps warm particularly sensitive birds and mammais

Providing the right food for all the animals in a soological garden is in itself a tremendous task. Taibits from all over the world—ant eggs from the Black Forest of Germany, gopher snakes from the prairies of Texas, dried thes from the shores of Africa's Lake Victoria Nyanza are part of the hill of fare. In fact, feeding the 3,000 birds, animals, and reptiles at the Bronx Zoo requires 124 different kinds of food.

The most expensive boarder there is "Alice," the Indian elephant, Her daily

schedule tails for 150 pounds of hay, fifteen loaves of tye bread, and a pail of bran thash mixed with oats. Three times a week, in addition, there is a bushel of sliced carrots, beets, and potatoes.

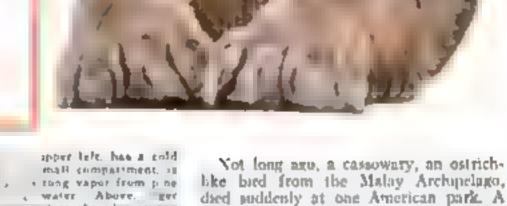
Peter the Great," her next door neighbor, ranks second. The meals of this 4.500pound Nile happopotamus include ninety pounds of hay, six loaves of tye bread, and a pail of much each day, with a bushel of vegetables thrown in on Tuesdays, Thurs-

days, and Saturdays.

In the but storage barns at the park tunothy, clover, and alfulfa hay are packed in the hundred-ton lofts to meet the tastes of all the guests. Alice, the elephant, and Peter, the hippo, eat tamothy but turn up their noses at clover, "Mogul," the great one-homed Indian rhinoceros, won't touch timothy but eats axiy pounds of clover a day. The antelopes like a little molasses mated with their alfalfa. The tapir and the

Beasts Live Big Cities





No one-course means, however, will satisfy the inmates of the monkey house. They crave and their menu is emused from day to day. Here ta & typical week. Monday bananas bowed potatoes, apples Tuesday carrots lettace, banaras cabbage

day, builed rice, dates, taisins. Thursday, oranges, boiled potatoes, bananas. Friday, lettuce, carrots, bananas Saturday, opples, bananas, oranges, boiled potatoes. Sunday, a few pieces of banana. The delicate South American monkeys have bone meal and codisver oil sprinkled over their food, Each evening, the big apes drink five or six cups full of eggnog before going to bed

While 200 officials thus take utmost care to regulate the diet of their charges scientifically, the public has a different idea. Visitors try to feed the animals a weird array of tidbits from cigar butts and follypops to golf balls and tubber dolls.

post-mortem examination revealed it had swallowed a wooden spool, a rubber nipple, a small doll seven metal pop-bottle caps, « k they gulp down about a ball, and a piece of stone an inch and welve pour is of butterfish, and a half across, It had managed these al. their diet never varies. The right. But when a woman fed it a faced taket for the five sea powder compact, that was too much. hons at the Bronx Park is \$1,han 2 00 pounds of butter-

At Cincinnati, Ohio, a \$6,000 hippopotamus recently choked on an indoor basehall and died. One of the paradoxes among animals is the fact that the hippo has a relatively small throat attached to its

Not long ago, a cassowary, an ostrich-

cavemous mouth.

Only the other day, a keeper at the New York Zoo found one of the pygmy hippos apparently frothing at the mouth. Someone had fed it a big tube of toothpaste! The polar bear cubs once ate two dill pickles and another time tried to swallow a piece of auto tire someone shoved between the bars as a special de icacy "Peter Boy," the red mustled deal, nearly died a few days ago from eating a not dog and his handkerchiefs, snapped up under the impression they were butterfish, made one sea hon a very sick aninial two summers ago.

As many as 80,000 people visit the largest zoological parks on a single Sunday Three mil ion passed by the cages at New York last year If only a small percentage of the visitors feed the animals peanuts or popearn, trouble ensues. Incidently, the keepers tell me, popcom is worse than peanuts. When an animal fills up on popcorn and then (Continued on page 104)

Polar bear diving into see cold pool to escape first warm day

pygov hoppos favor straight clover as fora Jack. he fo ven foot Nubian g raffe which eats twenty pounds a day from a the ager botted is the sade of his star ten feet from he groups

A he Philade phia Pa , zoo recently the \$6,000 baby gorda, "Bamboo," was provided with a special trained nurse who wa ched over his weithre and supervised his feeding. His meals cost about seventyfive cents a day and include two quarts of milk mixed with one raw egg, a few sices of bread and honey, awieback, five bananas, an orange, primes, grapes, and half a brad of lettuce.

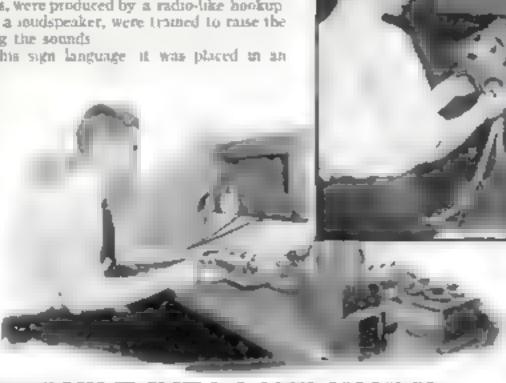
Feeding sea lions is a snap. See times a

#### X-RAY HELPS DOGS HEAR

WILL X-ray treatment improve the hearing of deaf persons? At the University of Illinois, experimenters have found that moderate, repeated exposure beneath an X-ray machine will double and even triple the hearing ability of dogs. Sounds for the before-and-after tests, were produced by a radio-like hookup. The dogs, standing near a mudspeaker, were trained to raise the right forepaw on hearing the sounds

To teach each dog this sign language it was placed in an

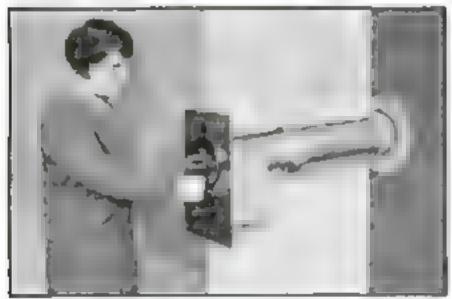
especially designed rack with its left forefoot strapped and its right one in contact with an electric terminal. The trainer would sound a tuning fork, and a few seconds later apply a mild electric shock to the anima, a right foot The dog soon learned to raise its foot, In another training method, a stream of water, squirted upon the dog's nose, replaced the electric shock.



A ring squirt of water on the note of this " g ang trane a right foot when the a sea of The a was trained for hear of teas d g X ay teatment

As a logic at it who are send author a surf year should be by surface of Electric obock was a an used to teach dog a same foot and or one he has done he

#### AIR BLOWER BUILT INTO BANK VAULT



New bank vault ventriator set up for demonstrat on shows how an imprisoned employe could start it from the inside and thus escape

BANK employes need not fear accidental imprisonment and suffocation in a vault when it is equipped with a new ventilator designed for such an emergency. Turning a switch lever from the inside opens the outer air ports and starts a motor blower, drawing in fresh air through the nickel-alloy cylinder in the vault wall. To talk to his rescuers, a prisoner may stop the blower and speak through the tube.



#### NEW SWIVEL PLUG WON'T TWIST ELECTRIC CORD

INSERTED in any wall outlet, a new swiveling "intermediate plug" is said to eliminate twisted appliance cords and the possibility of short circuits. Since it automatically lines itself up with the cord plug, it is especially useful in corners.

#### THEATER CONTINUES WARMING UP LONG AFTER SUN SETS



If you go to an evening movie after g sultry day, and the theater seems just to have reached its hottest, don't doubt your senses. Probably you are right, according to experts of the American Soci y of Heating and Ventilating Engineers. By exposing to the sun a model theater with interchangeable walls of different materials, they measured the time required

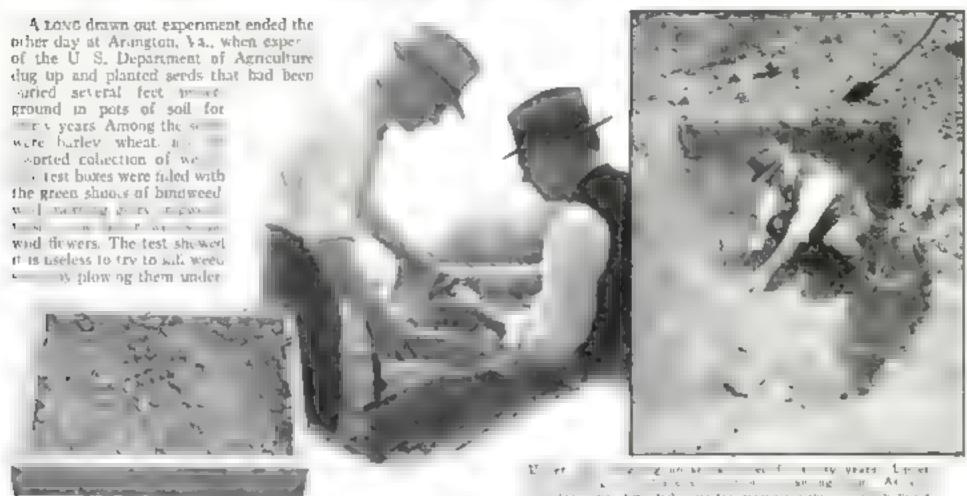
Above, a box-like chamber, representing & theater ant up in the sun to measure beer that passes through wall, Instruments mounted outside the cleamber record nears immedity

> At right observer in laboratory watching electric gages connected with thermometers in threits during the test of wall material

for heat to seep through a wall and make itself fully effective—a time lag that reaches more than six bours with a six-inch concrete wall. Thus a theater may still be warming up after the sun goes down. Designed to yield accurate data for planning air-cooling plants for theaters, the tests showed they must be three to ten times larger than usually estimated. With shiny alummum point on the outside of the building, however, less refrigeration would be needed



#### Weed Seeds, Buried Thirty Years, Grow When Dug Up and Planted



#### CONTAINER FOR CAR HOLDS FAMILY WARDROBE

CLOTHING for the entire family may be carried in a car, without cluttering the rear seat or the running board with suit-cases, by means of a new wardrobe container attached to the top. It is readily removable, may be hung in a closet and

left packed if desired, and may be folded to half its size for easy handling. According to the tracker sails and dresses are kept pently inside its folds without wrinking. The device is also suitable for installation in airplanes.



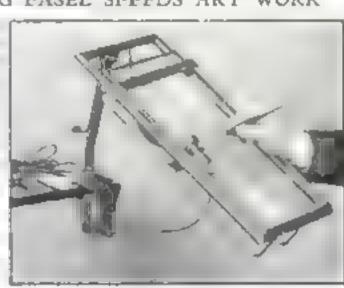


#### HAMMER HEAD LOCKS ON

HAMMER herds won't fly off when they
re fitted with a pair of locking strips
the a Mawaakie Wis leven a
Northes are out in the him he hear the



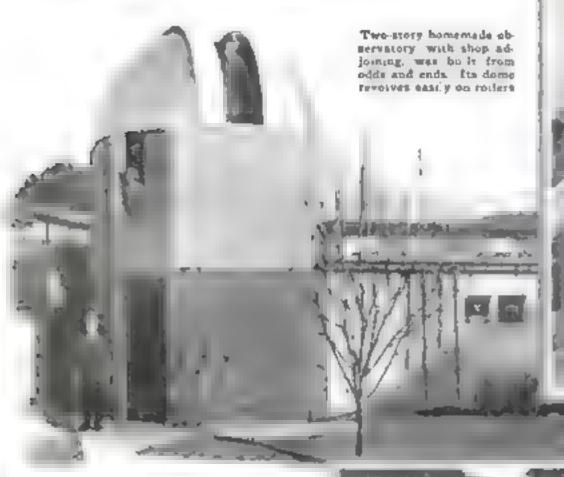


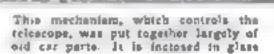


## Amateur's Home Built

## **OBSERVATORY**

Wins Astronomer's Praise





Rare Skill Shown by Star Gazer Who Used Odds and Ends in His Telescope, Mounting, and Housing

HREE years ago, George F
Tauchmann of Berkeley, Calif.,
knew no more about the stars
than the average schoolboy, nor
did he have any means of studying them
Now he can range the akies intelligently
and pick out and identify the better known
stellar bodies. He does all this with his
ten-and-one-half-inch reflecting telescope,
set up in a two-story observatory with a
regulation revolving top.

regulation revolving top.

Telescope and the observatory were built by Tauchmann. He laid out and created the building from

erected the building from foundation to dome, performing every part of the work himself—carpentering, sheet metal work and glazing—except for bending two pieces of two-inch angle from into half circles to furnish the necessary stiffening for the metal dome which is thirteen feet in diameter,

The telescope is built olmost entirely of salvaged material. It is mounted on a tall, kitchen range boiler, inside of which hang the weights that drive the mechanism used for moving the telescope to compensate for the earth's ro-

HIS HOMEMADE REPLECTOR Below, Tauchman grinding his own telescope reflector from a ship's old portlights. The glass is revo ved by motor while he build a bravy piece of metal against it. Above, made the thirtupe-foot observatory aboving the complete attembly, with telescope away at right angles in the opening

tation. To overcome vibration, the bottom of the tank is imbedded in concrete set in the ground. Both halves of a Ford rear axis bousing are used for swinging the instrument—one as the declination axis the other the polar axis. One still carries half the differential bousing and this, filled with lead, serves as a counterweight. Old ships yielded port glasses which Taurhmann ground, poushed and silvered. He prepared the glass from the simple, flat, transparent disk as it came from the ship's side, to the finished re-

At present, Tauchmann is working on a twenty-two-inch reflector for a newer telescope, the construction of which will require all his spare time for a year or more. This will rank as one of the largest amateur-built instruments in the world. The present observatory is large enough to accommodate the new telescope, which will be completely new including founda-

Tauchmann insists it is impossible to build anything ike a good observatory or telescope without detailed plant. He followed this rule from the start, carefully planning every step on paper,

tion, mounting and mechan-

After a recent inspection of Tauchmann's plant, Dr. Robin. Grant Aitken, director of Lick Observatory, said he had seen many homebuilt astronomical observatories, but this one more nearly approached professional quality than ony other he had examined.

## Protect Your Family by Recording Their



By STERLING GLEASON

EEP a permanen of the higgsprines of each member of your This is the advice ut police, hospita, officials, and all others who know the truth a wat the thousands of mysterious dis ppearances kidna, ngs. and suicides that a annually. Various agencies will make such a record for a moderate fee I clice, in a number of cities have volunteered to make a fingerprint record of ch laren without charge for the parents who request it. No record is kept by the police, the impressions being turned over to the parents for

Such a record, along with a physical description and a photograph or two, can be kept among family keepsakes, and in case of emergency might furnish the clue that would restore a missing layed one to you, or frustrate the plans of crimmals. If, for example, the fingerprints of the Lindbergh baby had been on file, his parents need never have paid \$50,000 to impostors who did not have the child in their possession.

Many hospitals now take footprints of

You can make a second of your own ingerprints some at to this one made by the Los Angeles posted department by putting each prior in a labeled square, rooking fagers to get clear impression

new-born babies, to prevent mox-up of the infants. The fingerprints of the mother are also recorded so as to prevent subsequent doubt as to the parentage

You can yourself easily make a fingerprint record in standard form that can be utilized by the identification experts. To do this, rule off ten squares on a smoothsurfaced card. Printer's ink should be used to make the impressions, although smooth

be applied to price of grown with a tubirel solar. Discribute all evence and roll the hugern to get inh into the depositions

paint dited until it is tacky, will, do, if a culther roller is available rid it with ink, then roll it across a pane of glass leaving a black film unon the surface. Or, somely apply the film with a cloth

Next, tak the fingers by pressing hem down upon the glass, and transfer an impression to the card plat of the print of each finger in a separa equate and labeling it. In taking the impressions, press the finger had against the card and rol, it shouly each side to get a complete pattern of all the tiny ridges. Do not, however, allow the finger to slip and blur Next, bunch the fingers and make a complete print of the fingers of each

On the back of the card may be attached a pair of photographs, preferably a front and side view, and if desired, a pair of footprints. Other data which should be included are bright, weight, color of hair and eyes, date of birth, build, complexion, any scars or identifying marks, and a specimen of the handwriting or signature, Stored away in a safe place, such a record may prove to be worth many times its cost

#### Streamlined Auto Designed by German Airplane Factory



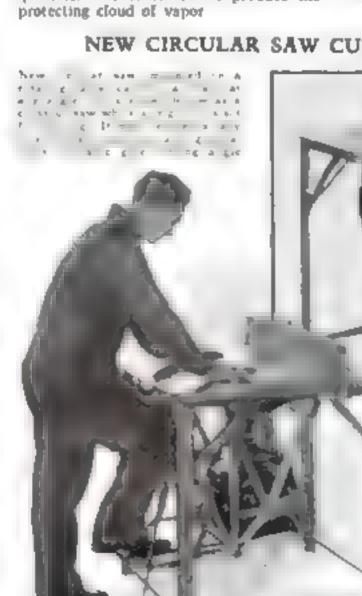
DESIGNERS of the famous Junkers airplane firm of Germany have now turned their attention to the improvement of motor cars, with the result that advanced aerodynamic principles are built into a new automobile offered to the public. Its streamaned body, devoid of projections, is designed to minimize wind resistance and consequent fuel consumption. Fenders and running board melt into the smooth profile, and even the door bandles are recessed. A compartment in the side of the bood bouses a spare wheel, and the interior of the rear end provides space for luggage

Aerodynamic principles are incorporated in streami ned car shown above. At right, compariment for spare wheel in side of head, with door open for removal

#### ARTIFICIAL FOG SAVES GARDENS FROM FROST

FIGHTING frosts with artificial fog will be tried in Germany this fall, in the vicinity of Hamburg. It is expected vegetables will be protected by clouds of chemicallyproduced must. Into drums of unstaked lime, dissolved sulphur trionide will be allowed to drip when the farmer receives frost warnings from weather bureau headquarters. The reaction will produce the protecting cloud of vapor

#### NEW CIRCULAR SAW CUTS AT ANY ANGLE



#### SKELETON ADVERTISES FACTORY'S PRODUCTS

To advertise his products in an unusual way a Hartford Coun manufacturer constructed the giant 'skeleton' pictured above and placed at on exhibit. Its bones are formed of connecting rods, springs, and vises, while the skull of the monster contams bobbms and rifle triggers.

THE RESERVE OF THE PARTY OF THE 77 7 4 7 4 7 4 7 ( E' ) ( ) N THE E 3 T . TER TO WAR ESCY IN u f-g fla 5 s W 114 4 6 some the time of the state real and the second second a comment the comment a bathe is a finger The me r sha is it as we in his in it I be maxing . e v retur tions on he the op show the ange at which he aw is se

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Letter piles of sand are revealing bitherto unknown secrets of steel in the hands of Dr A. Nada: Westinghouse research engineer. In particular, the sand models show the exact amount of force required to twist and deform steel bars of various cross sections. If a steel bar is twisted just a little, it will spring back unharmed when the pressure is released More force gives it a permanent twist by exceeding the bar's limit of elasticity, and chough force will break it. Dr. Nadai measures the last two forces thus.

B riped mude a, al wood are made from

hand pries for further study. Asternate

layers of dark and ghe wood are use by in any young the distorting forces

First he cuts a piece of cardboard exactly to the size and shape of the bar's cross section. Then he piles upon it as much fine, dry sand as will stay there without spilling over the edges. This heap-



takes a geometrical shape determined by the shape of the bar. The volume of this and pile, Dr. Nadai demonstrates math ematically, is almost exactly in proporOr Nade: studies the uches or of stock with sand piles. At left is rest chamber used to produce sample at right in which white areas show what the yields.

tion to the amount of force required to

Another experiment shows how the metal becomes plastic and "flows," under enough force, to take a new shape. A hollow glass shell is constructed in the shape of the sand pale, and coated on the made with oil Then a membrane of tart rubber, stretched flat, is sprinkled with powder and forced into it by air pressure supplied by a tire pump, in an especiallyconstructed air chamber. White marks, adhering to the oiled shell where the powdered membrane has touched it, show the parts of the bar's cross section where the metal first yields or "flows," While the mathematica used in proof of this is complicated, the test itself is simple

German boys build their models of fattoom thips large enough for them to go tailing in

#### MODEL BOATS

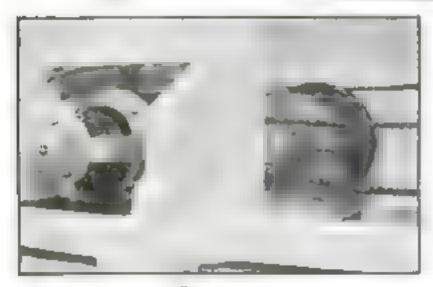
Schoolnoys of Putsdam, Germany, have gone in for ship-model-making on a larger scale than many of their American rivals. Under the direction of Man Bartsch, naval engineer, they are turning out seaworthy craft large enough to sail with their constructors aboard. The photograph reproduced here was laken just after the launching of two of the remarkable m o d e l s-representing the cruser Hindenburg, seen at the right in the picture, and the five-masted training frigate Prenssen-in the river Hadel, near Potsdam, The miniature Prepissen measures twenty feet from bow to stern. One of the boy model builders can be seen seated within the hull of the Himdenburg

#### Ferryboat Crosses River on Trolley Wire

An alectric ferryboat that runs on a trolley ware, believed the first of its kind, has just been tried out successfully in California. Carrying twelve automobiles at a time the flat-hottomed craft plies back and forth across the Sacramento River at a speed of approximately 180 feet a minute. It thus makes the crossing, loaded with twelve cars and passengers, in about two minutes. Its cost of operation is estimated at one-half that of an ordinary gasoline-engine ferry. The boat pulls itself across by one of the two trolley wires that form a







Print placers lerry to tun un trolsey were in shown at top moored to bank of Sacramentto R ver. It car t on 2 cars at a time Diagram g ver attangement may rady soldes lo he sowered into water without Castin 2015 Prode At all close up of le ry a motor and one drive sheave complete circuit to carry current to the motor in the craft. Because the Sacramento River is a mavigable stream, and the trokey cables must be dropped to the bed of the river to permit up and down traffic to pass, the engineers who designed the ferry were presented with an unusual problem. The wires must be bare for the trolley wheels to make contact with them, yet, when they were dropped into the water, they must not short-circuit. The difficulty was solved by insulating the "live" cable at each end and energising it through a "slip" connector, a foolproof device which automatically shuts off the current when the cables are lowered into the stream by hand winches. The railroad commission of California has approved the installation of the strange ferry

#### AUTOMATIC SHUTTER FOILS WINDOW THIEF



#### GROWS STRAWBERRIES IN OLD AUTO TIRES

A STRAWBERRY garden has been made from discarded auto tires by a Pasadena, Cauff, disabled war veteran. He stacked a dozen of tires with six two mich holes cut in the trend of each and tired the inside with earth. Strawberry plants are put in the upper hales



As the brack is buried through this display window the jointed from shorter drops down and automatically locks stand to prevent their

To rott the thief who smashes a jewelry store window, a Lundon, England, inventor has devised a shop window hat is declared to be proof against locting A jointed from shutter is poised at the top of the window, on the ins de. The moment the window is broken, the shutter is to eased. It drops across the window display and autoinatically locks at the bottom. At the same time an alarm is sounded. A demonstration of the new device was recently given when one of the shutters was instaked in a shop. The inventor burled a brick through the window Prompt y the shut er descended and locked.

#### NEW ABRASIVE CLEANING STRIP IS FLEXIBLE

HANDY for cleaning the contact points of a car's ignition system, and for smoothing down the commutators of electric motors, is a new, flexible step bearing an abrasive. Because of its thinness and dexibility, it gets into places where an ordinary grinding stone could not be used. Even the hardest metals, such as tungsten and placinum-indium alloy are easily hied. Since the flex hie abrasive strip does not short-cleant an electric current at may be used to dress a motor's commutator while it is running



This abrasies strip, thin and flexible, can be used to clean an corners used by maccess his



#### FLOODLIGHTS BRING MIDNIGHT GOLF

Floodistant god," played at night by the and of powerful lamps, now provides recreation for many who cannot ensor the sport by day. The photograph above shows the result of lighting a green at a ban brancisco course one of the first to metate the new sixe. The installation comprises more than a hardred [ 5 to-wart lamps, and engineers say that there is twice as much light on the fairly your herough as is ordinar to brown on the average office desk.

#### ENGINE BURNS ITS CARBON MONOXIDE





#### PORTABLE SEARCHLIGHT HAS HALF-MILE RANGE

A new portable search ight, capable of aghting up an object a half-mile distant, has been placed on the market. It weighs thateen pounds and draws its current from a storage battery of fifteen ampere-hour capacity. The battery will keep the light burning steadily for seven hours.

#### OIL PENETRATES METAL

Discovery that oil penetrates metal, instead of merely forming a chinging film on its surface as formerly supposer, may improve lubrication merenes. According to two experts who secently reported this surprising fact, oil may be wiped from the surface of a bearing and a new film will soon appear.

# OUT OF THE AIR



At left commenced parties of personner tomper farting head first a south erof seconds after earing his mane. Above, the climb a partially open and has already awang the facting man feet down

F EVER I meet a silkworm, I ought to up my hat three

That is the number of occasions—once in moonlight over the Pennsylvania mountains once above a railroad track in Indiana and once in blinding fog over Georgis—that parachute ailk has saved my life.

A big moon was tipping the treetops, one October right in 1925, when I took off from a little field near Hagerstown, Md., to fly a secondhand Curtiss "Ortole" to its owner at Rochester, N. Y. The ship had been sitting out in the weather for mooths. Its paint was mostly washed away and its canvas half fotten. When I climbed abourd, I buckled on my parachute.

Everything was going smoothly when I passed Beliefonte, Pa., where mail planes land. A few minutes rater two clusters of pur-point lights, marking the towns of Snow Shoe and Sugar Camp, shipped past under my wings and I headed out over eighty miles of bad mountain country to the parth.

It was almost ten o'clock and I was only an hour from Rochester when, without warning, the ship gave a sickening drop. I peered out the right side of the cockpit. The trailing edge of the lower wing was flapping in the moonlight. The rear spar, probably weakened by dry rot

had snapped off at the fuselage. I cut the switch, flipped back the catch of my safety belt, and dove headfirst over the teft side of the cockpit into space.

As soon as I was clear of the plane, I yanked the rip cord and the parachute opened I was still 500 feet in the air when the ship crashed, half a mile away. A thirty-foot sheet of flame shot up from the wreck, tinging the trees and clearings with red. I landed in a little open space that had once been a potato patch. Cramming my 'chute into its pack, I started across the rough timberland in search of a farmbouse.

Half an bour later, I found a winding mountain road and followed it for miles until I came to a house in a vatley. Here an old man got out a battered runabout and took me to Towanda, Pa., where I caught a train for home

In all, I have come down out of the sky in parachutes fifteen times, including three emergency jumps. People often ask me how it feels to fall handreds of feet through space before the parachute opens. They want to know if the fush of air doesn't choke you and if the sensation un't like falling in a nightmare

On first jumps, you usually hold your breath until the 'chute pops open, Later you bail out breathing naturally. I have never beard of a jumper bothered in breathing by the rush of air, even though the velocity of the fall may reach two miles a minute. The sensation is hard to describe. It isn't anything like a night-mare. As you plunge downward, the air seems to busy you up. The feeling is a little like falling on a feather bed.

I remember one rookse pilot who made his first jump from a plane I was flying. When he crawled out on the wing at 2.000 feet, his face was as solemn as a board owl's. But he was game and dove off I went into a steep sparal to watch him fall. He dropped and dropped. I was in a cold sweat. Then, when he was only a black dot, the white mushroom of the



Leaving a plane for a parachute jump

All the Thrills of Leaping into Space from an Airplane Are Packed into This Article by RANDY ENSLOW, Veteran Pilot

# ON A BAG OF SILK



The first parachete jump I ever saw was at Ivanhoe, Oksa., when I was nine years old. Our family drove in from the tanch to see a woman in red tights drop from a hot air ba loon. When she landed the balloon sailed away over the prairie like the setting sun.

When Capt, Albert Berry made the first descent from an airpiane at St. Louis in March, 1912, he had a big metal cone attached to a crosspace in frost of Tony Janual Benoist biplane. This held the silk and kept it from tanging Later, the parachutes for airplane jumps were packed in big canvas bags.

I made my first jump with one of these bag type 'chutes near Deepwater, Mo., in 1921. My brother and I were barnstorming with a standard plane. The people were all going up for rides so we thought we would give them an extra treat. We packed the 'chute in the big canvas bag and tied it to the outer strut at the tip of the lower wing by means of ropes. Then we snapped the ends of the harness straps to a bracing wire to keep

them from whipping and took off
At 2,500 feet, I crawled out on the

wing, unmapped the straps, fastened them to my harben, and then swung down, dangling under the wing. The bag was closed with a laced cord and a bow knot. When I reached up and jerked the knot, the whole inside of the bag fell out and I dropped, the 'chute opening as I fed

Modesn parachules are compressed after being carefully folded, into square of oblong packs of khaki canvas. They are worn in three different positions strapped to the chest, the back, or, in most cases with aviators, in such a position that they form a cushion to sit on during flight. A "pilot 'chute," equipped with a spring so it pope out like a jack-in-the-box when the rip cord is pulled, helps drag the main parachute out of the pack so it opens in the quickest possible time after the ring is jerked.

My first emergency jump was probably the most amazing escape I have had in sexteen years of flying. It was all over in a few ticks (Continued on page 101)

Before the parachutes are packed in their bags they are bong up in a high ceilinged room and thoroughly inspected to be sure no defect may bring disaster as an emergency



Ourmany, also fearing gas roids from the gir, is ira a ag her su diera and was dage to west gas masks. The photograph above a dog, masked for safety, being beid in the dead y fumes to accustom it to experience

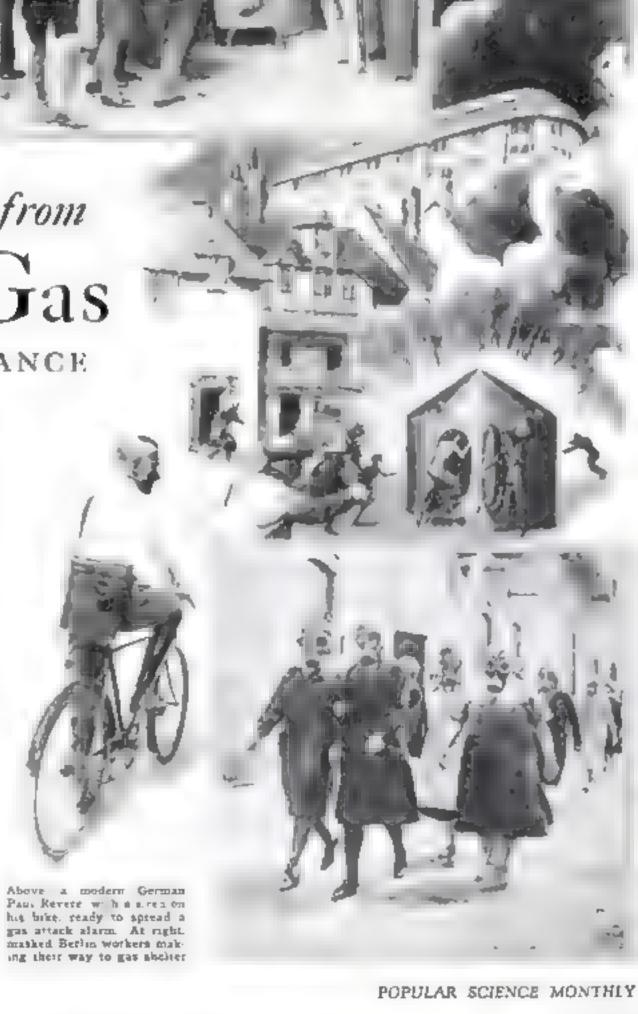
## New Shelter from Poison Gas

TESTED IN FRANCE

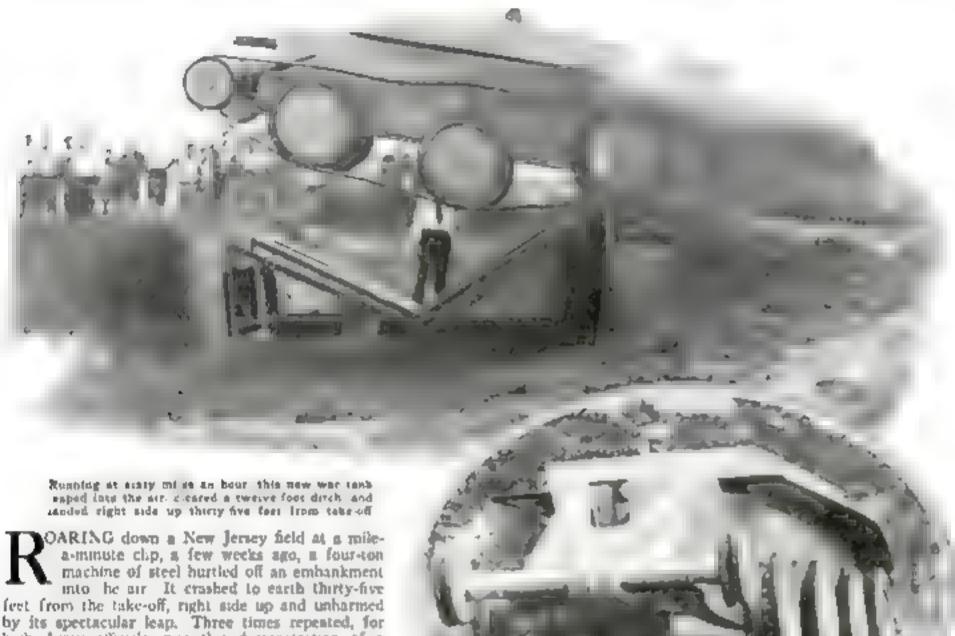
RUL ND a little house with a conical roof, exhibited in Paris the other cay a knot of excited Frenchmen gathered. It could be erected quickly in any smal space, the inventor declared for protection against a poison-gas attack When the owner's family hurried into the concrete abel er and slammed the aut-tighdoor, they could live for hours, or even days, sustained by oxygen apparatus.

Strange to American minds, the thought of a gas a tack is no emp a bogen to many Frenchmen. So seriously do they take it that gas masks have actually been placed on sale in French shops, and were adver-tised ast winter as " deal Christmas gifts Germany, meanwhile, has begun a national campaign to train the public in self-protection from gas raids. Russia is reported to require as many floors underground as above ground, when feasible, and rooms convertible into gasproof chambers, in newly exected buildings

What has made continental Europe so gas-bunded?" As a French military observer points out, aviation's rapid's rines. now bring danger of air raids and gas bomos to cities far from battle fronts. It another war comes, noncombatants will be exposed to more terrible perils than ever before. Faced with such a menace, many European countries are making nationwide plans for civilians' protection.



### New War Tank Jumps Ditches



high Army officials, was this demonstration of a "Jumping tank" that will vault trenches and shellholes at full speed

The new tank owes its leaping ability to powerful springs on which the wheels are mounted. Their exact construction is the secret of J Walter Christie, builder of high-speed tanks for the U/S Army and inventor of the new jumping tank. It is known. however, that the springs make the tank leap upward when it hits a bump at full speed, much as a springboard gives a diver a boost.

In actual combat the driver crouching in a padded seat behind a steering wheel like that of a standard motor car clears a trench by a fast takeoff from a suitable raised spot

Has skill in choosing the place of leaping and his speed, determine the length of the Jump. The springs absorb the terrific im-

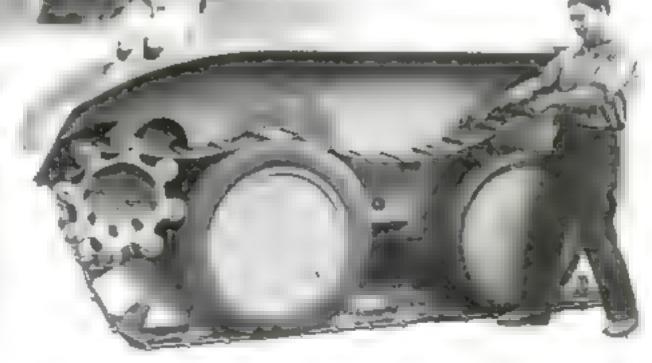
pact of landing

Remarkable aside from its jumping, the new 1,000-horsepower tank is believed to be the fastest ever built. Stripped of its endiess treads, it was clocked at 110 miles an hour. Three-inch guns serve as arma-

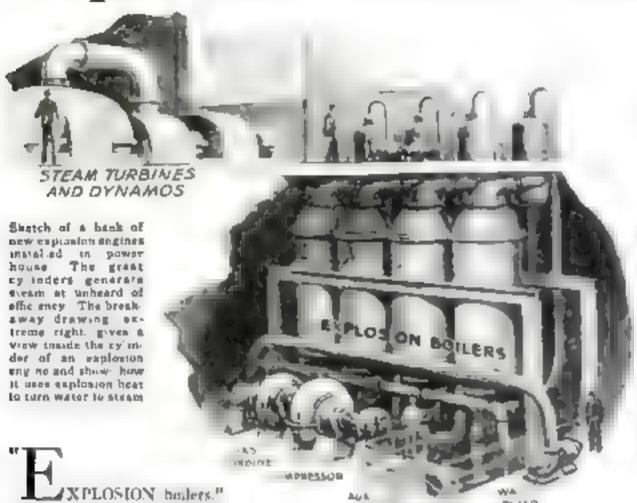
Soon Christie plans to fit his jumping tank to be carried from place to place by a large amplane. This innovation in watfare is a modification of his original planto equip the tank with wings and propeller to fly it under its own power—a project that may be worked out later

Below, removing the endiese treads from the jumping tenk to try is speed when tunning an rubbertired wher a. Above, sank without treads ready for test on smooth road where it went 110 miles an huar

At left view of front horizontal, incaned spring on sumping tank. Detact of the spring are a secret but it is the opting that gives tank its power to jump



### Explosions Drive Giant Turbines



OR THREE ME

retembling mant automobile

cyanders, will soon turn water into steam to drive turbines of ships and power houses. The boilers will be, in effect, the bigges, interna -combustion engines in the world. Each one is large enough to swallow an entire automobile and more, Animated by oversize spark plugs, the cylinders chug-chug with a slow, measured best, but no pistons move inside them. Instead the concentrated heat of the explosion is trapped and used to vaporate water in a nurrounding jacket,

Ordinary ateam boilers, domestic and industrial, burn their fuel under normal atmospheric pressure much in the fashion of a kitchen range, Seeking greater efficlency, engineers of the Brown-Boveri firm of Switzerland, designers of turbines and other machinery for some of the

world's largest power plants, conceived the idea of burning fuel under pressure and even exploding it.

A compressor forces the fuel-gas, oil. gasoline, or coal dust-into the mammoth combustion chamber. Inset valves close and spark plugs ignite the mixture from forty to sixty times a minute. After each explosion exhaust valves open, and scorching exhaust gases, bearing the heat energy of the explasion, righ out through tubes an the top of the boiler. Here they turn water that surrounds the tubes to steam Led down the side of the bosler the exhaust gases give up their remaining heat

to warm incoming water in a prehenter. Finally the cool gases, still under pressure enter a gaa-driven turbine, rotated by their impact, which furnishes power for the compressor that feeds the boiler,

Meanwhile, the steam is freed of water in a centrifugal separator and re-heated in a superheater coil within the explosion chamber of the boiler itself

Just as a motorist regulates the speed of his car by stepping on the foot throttle, so the output of the new explosion bowers is controlled at will by regulating the rate at which fuel is supplied. For starting, an aumiliary motor or turbine operates the compressor and it may be cut in again at any time if the turbine is insufficient.

Tests with an experimental expresion boiler at Baden, Switzerland, are reported to have shown almost unbelievable efficiency, indicating that it is possible, by this method, to extract more than 100 percent of the heat that the fuel theoretically contains. The apparent paradox is explained by the fact that the exhaust gases, first cooled and then allowed to expand, are finally discharged at a temperature actually lower than that of the surrounding air. This "heat pump" effect has never before been used in such a machine.

#### AUTO ON CABLES IS RIVER FERRY



ONE of America's strangest fernes, a Mandard motor car running on suspended caliles, now carries passengers across the Pudding River near Barlow, Ore, Two strands support the ear, which runs under its own power, while a third, through a pulley cradle, steadies the vehicle at the top. The only a teration made to the car consisted of removing the tires and placing flat rubber bands around the rims for traction The owner of the ferry says he can make the 120-foot crossing 1.760 times on a gallon of gas.

# Invent It?



HERE is a coil of round brass spring wire, open-wound, as shown in the diagram. How would you make use of this coil to produce a hollow flexible tube of the same diameter as the coil, without modifying the cuil in any way? You are free to make any additions you wish, but the coil of wire, as shown, must be included in the finished tube. The solution of this interesting problem, which you are not likely to find especially difficult, will be published in the November issue of this magazine.

Last month you were shown a diagram thustrating the action of an ordinary typewriter. You were asked to modify the mechanism in such a manner that the clatter of keys on the platen roll would be eliminated so your invention would result in a noiseless machine. Here is one solution of this very interesting problem When the key A is pressed downward the force transmitted through bellcrank B, link C, and lever D acts upon the jointed type-bar E, straightening out the bend and pressing the type F into gradual but forceful contact with the platen roll G. This eliminates the hammer-blow which makes the ordinary typewriter so noisy The plat-en G should be made of metal, instead of rubber, so the gradual squeezing between type and platen may make as good carbon copies as the hammer-blow stroke. You probably thought of other solutions to this practical problem but the one given here is the simplest and most satisfactory that could be given in a limited space

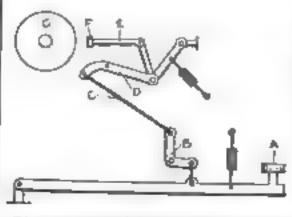


Diagram showing how to solve that month's problem regarding a conscient typewriter

### Baffling After-Dinner Stunts

CIGARS or cigarettes are practically all you need to perform a number of amusing and baffling stunts suitable for the relaxed period that follows a full dinner Sex of them are illustrated and explained on this page and only a couple of minutes' practice will be needed to enable you to do the most difficult of them. Once mastered you will get a lot of fun using them to durafound your friends



MAGIC CIGAR
STICKS TO HAND
The position of the thumb
has cerbing to do with
the clinding nature of the
triger. A hooked pin is put
beneath the hand and the

beneath the hand and the post of tags to the hand amount gentures then will not dislodge the cigar When passed to guests for examination the cigar in quality slapped off the pin

LIGHTING UP AT A DISTANCE. A match that is hold also or eight inches below the end of a cigarette will light it as quickly as though it were hold closely. It coke speaky but is bread on the fact that the hottest part of a flame is invisible. If the match is moved plawly beneath the cigarette this hottest appt will east ly be found.

A VANISHING CIGAR BAND. The band to in plain night on the eight but a night powerward of thumb and fingers causes it to disappear. To do then track remove the hand out it in two, and a us one-half back in place. Then the band was sheen so the eight in turned

SMOKE WITH YOUR MANDS. Hold a cognecte as shown above with the hands bands tight y clasped. As the hands are a only pressed together and then allowed to expand, the cigarette w I pufferently as though you hand it between your lips and draw on it. The reason is that the movement of the hands crastes a small vacoum and air is drawn through the cigarette. It is a imple but it with startle and hewider the guests.

cigarette does out conarettes that burn until deliber atoly arringuished, will go out of their own accord if placed to the end of a kn fe as shown above. The metal in the knife absorbutest so fast tubacco can thurn but your friends, not remembering this simple fact, will be astounded. A similar trick is illustrated at right. A burning eigerette is faid on table liness beneath which a half dellar has been placed. Metal beeps the cloth from burning has don't try it on your best lines.



#### Find Mother-of-Pearl Clouds Fourteen Miles Above the Earth



or more observatories and measuring the relative displacement in the pic ures. Thus he showed mather-otpear closes to be far above the level of corrus, the feathery are cloud sometimes

This discovery has heightened interest in another phenomenon, the noctificent clouds seen during summer nights. They are blush white and not indescent and are believed to be dust closes. Early observations in teste a possible beight for these clouds of fifty indes or more.



### WARNING AT ROADSIDE PROTECTS PEACOCKS

Mororists on the boulevard near Arcadia, Calif., may are the odd sign pictured here, believed to be the only one of its kind in the country. Its warning concerns the welfare of Baidwin Ranch peacocks that occasionally cross the highway. The boulevard smooth and wide tempts to speed and hence the warning sign seemed necessary.

#### COPY 800 TREE LEAVES ON TABLE TOP

COMPLETE JOSSONS IN botany are embodied in a "'nature table" designed by David French, of Pomona. Calif It contains more than 500 mlaid copies of leaves from different species of trees, faithfully executed from tracings of real leaves and made of wood from the trees represented. French spent twenty years collecting specimens of rood, meluding such varieties as mount in tahogany, camphor, orange and nine kands of eucalyptus. An old stump standing unnoticed for a quarter century on a

mountain road in Eldorado County, Calif., furnished a sample of incense cedar. The fragments, assembled under French's direction make an unusually handsome piece of furniture. It is embelished with appropriate inlaid quotations from Emerson, Whattier, and Browning.



## Whirlpool Tube Puts Hole in Sea

plished by an amazing "whiripool tube"

upon which a patent has just been gran ed

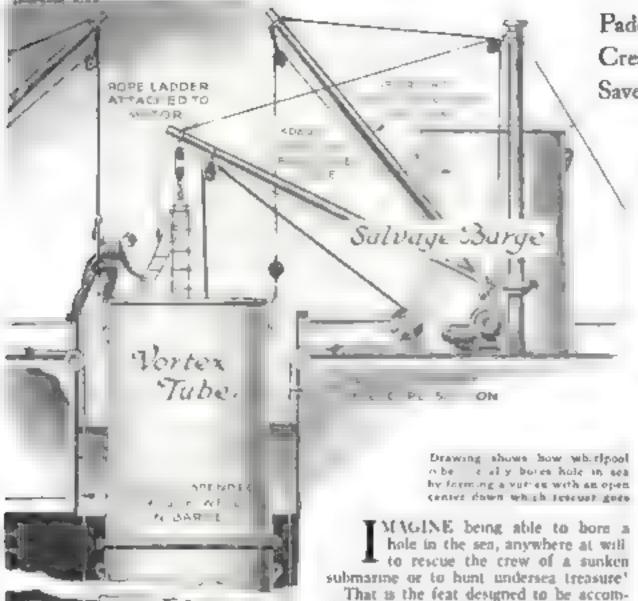
to Edward A. Adler of the General Erec-

trac Company Consisting of a telescopic

tube open at top and bottom, and a set

of motor-driven paddles rotating at high

speed, it operates upon the same principle



Paddles, Revolving at High Speed, Create Vortex Inside Which Life Savers Go to Disabled Submarine

that forms a hole in the water of your bathtub when the stopper is pulled

When the tube is lowered into the sea through a well in a salvage barge and the motor is started, Adler maintains, the caure column of water will be set whirling its own centraligal force will draw the water to the sides of the tube, leaving a hole straight down the center. A salvager may descend a ladder through the hole surrounded by churning water, without getting wet, and under normal atmospheric pressure. There will be no need of a daving stall

The "whirlpool tube" differs from sactuage devices previously built or proposed in that no effort will be made to keep it waterlight, or to make an especially close-bying joint with a develect on which the tube a bottom rests. The force of the artificially created vortex will be more than adequate. Adder says, to expel incoming water and preserve the "manhole" in the tube. In fact, the only purpose of the cylindrical shell is to overcome the difficulty of controlling a vortex in open water

Uses for this tube will be manifold Adier foresees. Besides its more special adier tasks in submarine rescues (as justified by our arist on this month's cover) and the recovery of gold from nunken ships it may be employed to collect dysters, edible resweed, and other marine products from the bottom of the sea

#### NEW TOILET KIT FOR CAR HAS RUNNING WATER

Three views show to set set for car closed, waver running, and in ase

Pt.\_\_\_Pt.

PARTOR O

MOTOR

## Fast Electric Car Tests Planes



New Aircraft Mounted on Strange Machine Show Flying Qualities Without Leaving the Ground

Past essed Prench plane

At we a gard after his we a warper of a trowle or the a Fe of the Paper washing the rocks base

ANY a hopeful inventor a dreams are vindicated or biasted at one of aviation's strangest proving grounds, not for from Paris at to France, by a little electric car ras correct contract

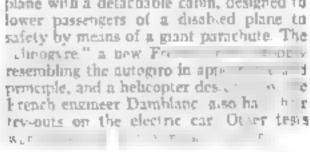
and cale for power.

Deminutive models or full sized a are mounted on this car and down the track at mile-a-minute velocity Instruments on the car make a constant record of the exact speed, wind pressure, and stram on the machine undergoing time Thus its behavior under actual flying condi ions is determined before it lakes to 15 The electric test car plays much the



r is as wind tunnels used of airworthiness, in which the a rdelite held scattonary and a rits

1 of the devices to be te "d upon the odd radway under the directal of the t souch air ministry was a model of an a replane with a detachable cabin, designed to lower passengers of a disabled plane to safety by means of a mant parachute. The theogyre," a new Fre r rot v resembling the autogree in approximation is principle, and a helicopter des. French engineer Damblanc also ha hir tev-outs on the electric car Other tesis





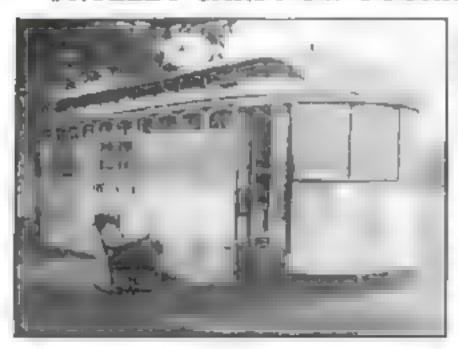
### Odd Rock Test Makes Dam Safe

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drill was put into ... e. Its cutting was cut without tare a "

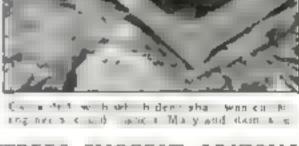
ree e e cera que e e e a b a Kar ,, THE THE WE WE SEE THE SECOND S T WE CY OF CY OF THE WORLD AND THE W This ruled a service a line of the service of the s

#### TROLLEY CARS NOW TOURIST CABINS



Trolley car, with wheels removed, becomes attractive summer cable.

1 2 2 VI 1 | 1 | 5 L = T 4 7 2 3 16 17 5 4 fs x Pg. 9 h 1/4 T 4 4" 4 33 7 We will grie he's ena was by he by Little Tax 3 c TE 7 - 41 - - -4 5 4 3 1 5, s April man and the second F O PATOD'S Loc X also electric hight completed the equipment.



#### TREES SUGGEST ARIZONA DROUGHT IN 300 YEARS

T Fig. 4 F T 3 3my 51 mbs 1 Tu 2 Tu 5 . . . . K . 1 . . . a star r st Rogs tear to have be a we rose a and also A.D. The requiarity of their recurrence forecasts a drought in 2200

# HOW THE MACHINE obberies

Amazing Exploits of Organized Gangs Who Steal an Entire Railroad, Loot Museums, and Take Autos by Wholesale

ils and pay off the ing, organizing abily is evident.

Last winter two unasual jobs were pulled A quantity of ice was stolen from a city reservoir in New York State. The ice was expeditiously harvested and removed-

cool job of there ever was one And who could hope to identify ice s his own

About the same time, two pro-prietors of a Brooklyn, N. Y., clotha store unlocked their doors for he day and found that 300 suits and overcoats had been stolen during the night. Such things are hard to trace in a large city. They change hands quickly

Following close on this theft Boston thieves lifted half a million

razor blades from a garage where they were stored awaiting shipment. The \$30 -000 worth of double-edged blades would

supply the entire underworld with close shaves for a long time.

Sharpers along a different line caused an unexpected drough I some months ago. In the dead of night they carted away a halfmile of lead pipe from the Entield. Mass., water system, Many were deprived of water, and one can imagine their amazement as well as indugnation. We expect water papes to "stay put."

with water, the report of a queer theft

comes from Chicago, Ill. A man in that city was arrested recently for making oway with 125 hathtub-

A michan barrels of crude oil is another item on this list of bigger and bolder robbenes. Not long ago, Texas rangers placed a dozen men under arrest in the East Texas oil field on a charge of tapping pipe lines from five wells and stealing that amount of crude oil. By means of bypasses, or pipes leading around the flow-

recording meters, they had obtained the oil over a period of more han seven months and shipped it to refinenes without being detected

Two million wasps formed the strange loot of thieves in another large scale robbery in California. The injects, known as gall wasps, were stolen from the fig ranch of Dr. H. C. Moore, near Merced These insects, which produce balls on the leaves of oak trees, are bred in large numbers for use in the fig orchards where, in laying their eggs, they fertilize the blossoms by carrying pollen from flower to flower

har sheer nerve it would be difficult to outrival the "live-wire" thieves of Michigan-the state that produces twothirds of those swift vehicles which make wholesale robbery possible. Last October officials of the Consumers Power Company were samply astonished when toluthat 150 miles of copper wire had vanished from the high-tension lines between Grand Rapids and Murshal.1

The lines at the time were carrying a heavy load of current. The robbers must have climbed the steel towers, risking in-

> stant death, to cut loose the heavy wires. In some unexplained way, they side-stepped the 144.000-volt electrocution that awaited them and removed sixteen tons of cop-

> The theft, unique in the power world, must have caused the owners of the world's greatest diamond mines, in South Africa, to wonder just how effective their electrified barbed wire entanglements would he against such modern Big Business

robbers. Stealing motor care does not pay. Three out of four are recovered, aften by insurance company alcuths. But wholesale thieves have succeeded in getting away with whole truckloads of valuables. Not long ago a large truck, loaded with nearly \$5,000 worth of motor accessories, was held up by armed men near Roselie Park, N. J The driver and helper were forced into a sedan, and two masked men drove the loaded truck away

and made off with 130 miles of copper wire that was at the time carrying a \$44,000-volt aucrent

Rishing doub at every instant thiswes out note

N A bright sunny morning, the manager of a Long Island, New York, golf club began his round of inspection. He whistled as he walked over the velvety fairway soon to be trod by light-hearted golfers

Then the sun scemed to stop shining, at least for the manager

His fifth green, his favorite where tous 117

He broke all records, golfing, running. and leaping, from that spot to his office His language outdid anything uttered beretofore on that course as he phoned the nearest police station

"Stole your what?" ejaculated the desk sergeant "Stole your whole golf green"

Well, 110 be . . . .

Two detectives, after four days of work, found that lost green. That was quick work, for they had a large island to search, much of it covered with green. The lost fifth green was found neatly stacked in a cemetery miles from the golf course. The thrifty keeper had purchased the truckloads from some young men he said. And that was that

The 400 square yards of turf were duly replaced, but the mystery of how this remarkable theft was "pulled off" in a single night, without raising an alarm. remains unsolved. Only a well-organized band with plenty of men, trucks, guns, and nerve could have done it

Many large thefts recently have been achieved without leaving a clue. From the "pick-up" men to the final "fences," and the shady financiers who sell the



Porced out of his truck toaded with silk, the covering the track when it crashed into a cor-

#### AGE HAS LED TO

# on a Gigantic Scale

# By ORVILLE H. KNEEN

Last year, in a raid on New York a garment center, a truckload of clothes worth \$20,000 was driven away. Two of the robbers were captured, but the driver got away with the loot in another holding \$22,000 worth of eighteles were taken. Trucks played their part when eight men stole eight tons of peanuts from a storage house in East Albany, Ga., a short time ago.

An attempted truck robbery failed when thieves forced a driver to turn over his truck loaded with \$6,500 worth of sick. The driver leaped into a taxi and gave chase. The fleeing truck ran

into a car and the robbers abandoned their baul. Three days later six bandits, with sub-machine guns and sawed-off shot-guns, made away with \$30,000 worth of silk, about 17,000 pounds. The driver and his helper put up no fight when they saw the battery of guns

Soun after that coup, six gunmen got



Returning from the theates, this Long Island couple found their 15-foot magnetic tree game



New Jersey bandits hidneped the driver and helper of a silk taden truck, seed them to treet, and escaped

away with an even richer baul—\$50,000 worth of silk—when New Jersey bandits kidnaped a driver and belper and tied them to trees. A large bridge party in New York was seriously upset when the driver of a truck hauling twenty dozen chairs and card tables for the bridge players came out of a coffee shop to find his truck stolen!

Another unusual truck theft, at Montclair, N. J., nearly "stopped the show" for Princeton's male dramatic society, the "Triangle Club," last winter. Two hours before the performance was scheduled to start, the collegiate actors discovered that the truck containing all the costumes and make-up to be used in their musical comedy had been stolen from in front of the theater. At the insistence of the audience however, they went on with the show learing, ladies" singing in tweed suits and trousered "chorus girls" going through their steps!

Frequently in truck thefus neither machine nor valuables can be found. They vanish and the insurance company pays the losses.

Stealing a single automobile is no longer profitable, but taking a job lot is another matter. A patrolman in Newark N. J., stopped on his beat to admire the bright new cars in a large showroom. When, some hours later, he again passed the windows, every car had vanished! Fifteen of them, the entire stock, had been removed, and the lock was unbroken. That would have been a good case for Sherlock Holmes himself.

European thieves are more discriminating in selecting their loot. Not long ago ten valuable paintings were stolen from a collector's office in England, mong with rare Person silk and women rugs, Flemish tapestries, and ivory carvings. Not a sound was heard during the robbery. At Vienna an arsenal was looted of museum pieces consisting of 200 golden crosses, an amongue silver statue of an ox filled with ducats, and other treasures of great historical interest.

ONE has stolen a complete museum—as yet—but last spring Joseph A. Fuerstman, a lawyer of Newark, N. J., had almost that experience. He repaired his two and one-half story frame house, built a new fence around it, and offered it for rent A month later when he went to look at it, be found only the cellar left.

Detectives found that families living on the street had torn down the house and fence piece by piece, using the lumber for firewood.

In Rockville Center, L. I., the other evening, when Fred Willard returned with his wife from a moving picture show and turned his car into the driveway he could scarcely believe his eyes. A fifteen-foot dowering magnolia tree, which had been in full bloom on the lawn when they left for the theater, had disappeared. Neighbors recalled having seen a truck, apparently having motor trouble, stop in front of the house and a gang of men dismount. No attention was paid to them and the tree was not missed until the owner returned.

New Year's pranks are not always humorous. Last year a former motorman stole an empty trolley car from the barns, and ran it for seven mues. No doubt he got the kick of his life by passing up all the wasting passen- (Continued on page 99)

### Smokestack Is Ventilator in New Liner



New Prench liner that has only one streaml and funnel which is also used as a ventila-

#### KILL JAPANESE BEETLES IN NEW TRAPS

Six hundred hox-shaped death chambers of wire acreen are aiding U. S. Department of Agriculture experimenters at Moorestown, N. J., to learn the best way of controlling the Japanese beetle Each box houses a colony of the insects and exposes them to a poison. Experimental plots of ground are then treated with the insects less of find whether they are as effective in the field as upon caged beetles. These areas bear signs warming the public, "Treated Plot, Flease Keep Off."

In ovel, death suspend Moorestown, N. J. in which wa soun possons are lested in his ing Japanese beetles. Above, one of the approximation publics.

### HOLES IN SPECTACLES SHUT OUT GLARE

GLARE-PROOF RORRIES COOsisting of aluminum cones fitted to the sims of spectacle-ake frames have been given ed for night driving. The user watches the road through amali holes pear the apex of the cone, The holes, sughtly to the right of the apex, automatically cut out the light beam of an approaching auto. When meeting a car at an intersection, the wearer, tilting his head forward a little lowers the apex holes, and prevents the light beam from entering the eye. Holes of the same size on the nuter aides of the cones give a view of the sides of the road at all times.



s eated with person in research work

Holes near center of these driving glasses shut off light beam and prevent glars; Juden at side give lateral vision

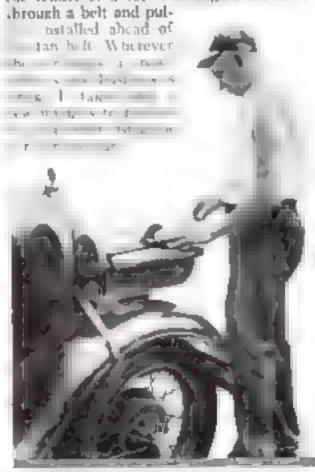
SMOKESTACK, ventilator, and grand staircase are combined in one on the new French liner Champlans. To reduce air resistance, the huge funcil is streamlined. An eval center passage carries the smoke away while fresh air, entering the funnel under a nim extending around the entire top, is used to ventilate the vessel. Below, the passage houses one of the grand staircases, passengers entering through two doors at the hase of the funnel



Close up of double corvies funnal which, shaped like a big Satron, ho is elationary

#### USES AUTO'S ENGINE TO RUN SCISSORS GRINDER

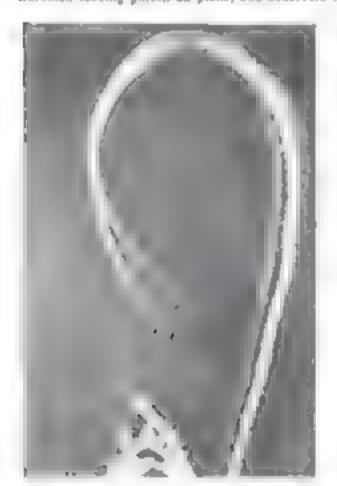
JUNKING his horse-and-wagon outfit, a New York seasons grander fitted a portable granding and of his own design upon the fencer of a car. The engine drives it



POPULAR SCIENCE MONTHLY

### Masked Flyers Spray Insect Poison





#### THREE PLANES WRITE BIG QUESTION MARK IN SKY

Question marks a mile long were written in smoke recently in the sky near Rome, Italy, Flying in formation, three pursuit planes wheeled above an airfield trailing white clouds of chemical vapor A fast, merry-go-round circle left a dot in smoke. Then a sweep across the sky formed the rest of the question mark.

#### ROBOT ANSWERS PHONE, TAKES MESSAGE

bell rings, an "exploring cod" in an attach-

ment mounted just above the bell box

is energised by electrical induction, It

watts fust fourteen seconds, and then

operates an arm lifting the telephone re-

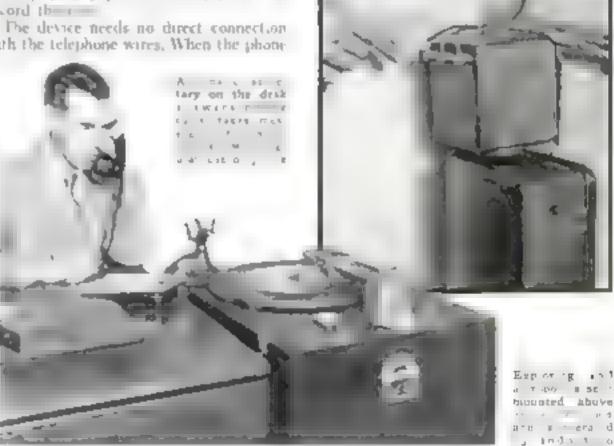
ceiver from the book. A phonograph at-

tachment informs the caller that the

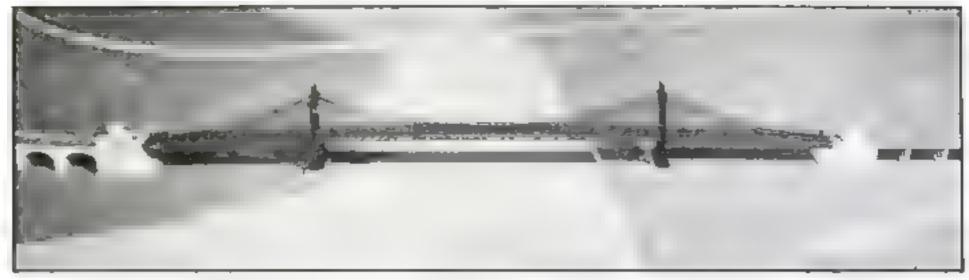
robot will record the message

A secretary that never talks back is the invention of S. Young White, New York engineer. His robot will answer your phone and take the caller's message It will also make a call for you, for example, if you want a long-distance message transmitted at night, you have only to dictate it to the automatic secretary and it will call up the porty, deliver the message at any predetermined hour antword the

The device needs no direct connection with the telephone wires. When the phone



Exploring and 0 T 400 B 55 1 biocoted Above and simera d

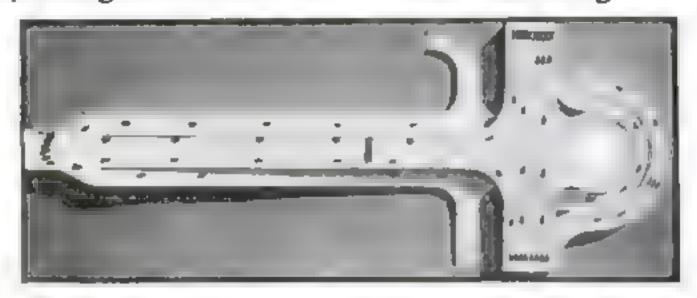


This 1,360-look again will cross the East River but it will be unly a small part of the 17,000-foot bridge planned for New York

#### New Three-Way Bridge for Cars Will Be 17,000 Feet Long

NEW YORK, city of islands now plans to solve one of its knottiest traffic problems with a three-way bridge for motor cars. The Y-shaped actuature, carrying vehicles between the horoughs of Manhattan, Queens and the Bronz, will save untold time for motorists who now use ferrice or make long detours to existing bridges to cross the natural water gaps separating the horoughs

By virtue of its magnitude and design, the new Triborough Bridge will be unique among engineering projects. Its three arms will total more than 17,000 feet in length, including a 1,380-foot span across the East River that by itself would rank among the great suspension bridges of the world. All arms join at a level high above the ground of Randall's Island, With three streams of traffic converging at this point, a ramp has been designed to distribute cars in the direction they wish to travel. Engineers extensive the bridge will cas: \$ 2,000,000



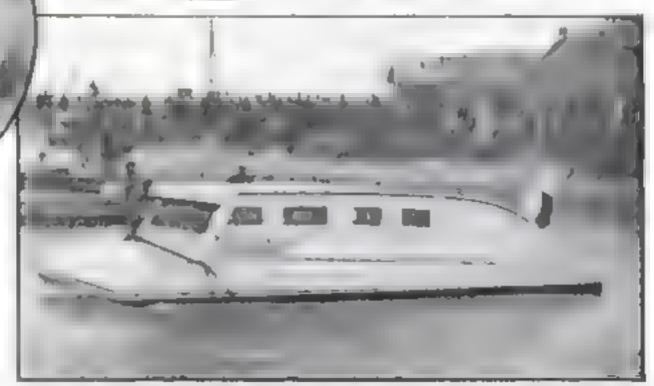


Upper view abowe the ingentious remp of three way bridge that will permit traffic to move in any direction it places. Above, are view of a model of the untile Treburough Bridge, men from Queens

#### AIR BLOWER DRIVES STRANGE FRENCH BOAT

Its power plant consists r sameen-horse-HOWER BASON ा व के विकास का nt blower. Compress I air from

Despite of propellers is a new the blower is shot toward the stern, bull, propelling the craft forward at a speed said to attain hearly forty miles it hour. The flat-bottomed boat drawn or ly nate it has of water



Strange French beet, with nurs-inch draft, which is driven by compressed air from a blower

#### FLIES RAISED TO ORDER FOR INMATES OF ZOO

PAMPERED captives at the National Zoningical Gardens, Washington, D. C. enjoy a diet of fles raised especially to their order. Bred in the pyramid-shaped cages of the "ily farm," as shown in the photo, the insects are collected to make bottles and fed to frogs and lizards.

#### "Flying Fish," Our Army's Newest Plane, Hits Terrific Speed

STREAMLINING gives the U.S. Army Air Corp's newest plane the appearance of a flying fish. The machine is known officially as a semilow wing monoplane for light bombardment, and military utility has dominated its design. It is constructed of alaminum piloy throughout The landing wheels are drawn up in flight, reducing air resistance and approaching the much-sought geronautical ideal of a flying wing. Two powerful engines mounted on the wing propel the machine at terrific speed



Highly streamlined, this newcot of the U. S. Army planes gives the appearance of a flying fab when in the sir. It is powered with two engines and in tests has attained unusually high speed

#### RAILROAD WORKERS BUILD MODEL OF CRACK TRAIN

Working during their spare time, employees of the Santa Fe railroad at Topeita, Kan., have built a remarkable model of one of the lines track trains. The locomplive is about five feet tall and

runs under the power of an old four-cylinder nationabile motor. Actual amoke from burning oil comes from the smokestack to give the illusion of reality. Each coach is made of steel and electrically

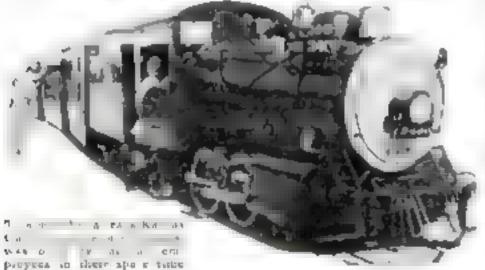
lighted

The "train" runs upon rubber-tired wheels. In the dining car are tables with linen laid and each chair occupied lay a doll diner There is an observation car with brass railing at the rear and folding chairs on the plattorm. All seats are upholstered in plush and leather covers drawing room chairs



#### PARKED CAR GUARDED BY ELECTRIC "FEELER"

An incensions "electric feeler" guards a parked car while its owner is away, sounding the horn if a cureless driver is backing into it. This curved metal arm with an electric switch at its base is mounted on the car's bumper about eighteen inches from the left end. A light touch on the sam is sufficient to close the switch and sound an alarm on the car's born.



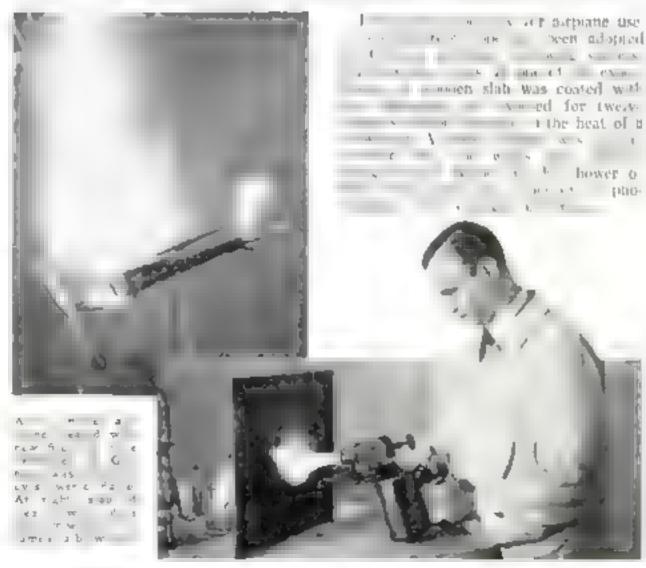
#### NON-SKID PADS CLAMP TO CAR'S PEDALS

EASTLY and firmly attached to your car are rubber pedal pads that keep your feet from al-pping off the clutch and brake controis. Suding metal books on the back of each pad grasp the pedal securely when brought together by turning a connecting screw, much in the manner of attaching skates with a key, as demonstrated in the photograph below. The rubber surface of the pad is cornegated in a non-skild design.



Robber non-akid pad that can be fastened to brake and clutch pedal by more turn of screw

#### NEW AIRPLANE DOPE DEFIES BLOWTORCH IN TEST





49441



AUTOMATIC OIL FURNACE Briter and he want before



RUBBER HAND BRUSH. When used with soap and water, this brush, of rubber, does not injure the honds and cleans them thoroughly

BROILER TURNS ON GAS. When the handle of the bruiter, left, in pushed down it puts the meat into busing position and also turns on the and regulates the heat while the food is cooking



he one by morely placing a only sale and place it is an abown in the party a as left

> product the state of E C IN P
>
> FF I C C C C IN IN T C NO NEE

GLOVES PEEL POTATOES. Canwas gloves, below have pa ma covered with thin attribuof twisted and after ched copper. When a potato a grasped and culibed with a ro. og motion between them the peel is removed. A bit of metal on one glove digs out eyes



### Tools to Minimize Labor



POAST CAN'T SLIP Holding devices and find the stand of the contraction of the contra A spring, in their grip, bolds much to pervise can be done with one hand



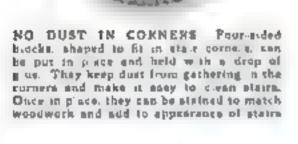
WATER AND AIR PAN. Your room is cooked and me store added to not with this electric to The fan is bet a rear a way as by a rubber belt so for a rub a rear ar



BRISTLES AND RUBBER. Into this

spange rubber brush, bristles have been se so he is alsy a complete on the second and second and second and second year of nut

TOPS REMOV. ED Heavy ridges 2 p 10 3 rrf k and draighted g 24 1 4 20 6 24 2 20 7 4 2 20





AUTOMATIC DOOR HOOK Screen doors are he d shut with a book that expands of contracts to about for swelling or ahranking



YOU CAN'T LOBE THIS CAP Quickly attached to tubes of dental or cold croam, the tubber cap a held to the tube by its rubber ring, and thus cannot be mistaid



LID AND KETTLE A series of differentaved rims. to the bottom of this kettie, make it possible to use it on almost any saucepan. When placed on saucepan, it becomes a cover and at the same time water can be boiled in it by heat of cooking food



HOLDS COLLAR BUTTONS. Ties are kept handy and in order on this novelty rack and in addition it carries, in a groove, the butions for a man's shirt so they are never lost and cannot escape to hide under the bureau

Experiments with GAS Simple Apparatus, Easily Arranged, That Can Be Used to Demonstrate

Gases, Solids, and Common Solutions

OLIVE

BOTTLE

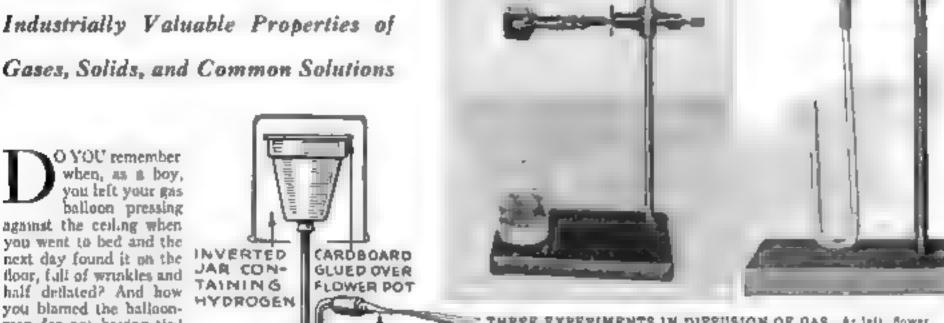
O YOU remember when, as a boy, you left your gas balloon pressing against the ceiling when you went to bed and the next day found it on the INVERTED floor, full of wrinkles and half dellated? And how you blamed the halloonman for not having tied the thread lightly? The truth is that no matter how tightly the thread was lied, the hydrogen would leak out through the rubber itself Such a flow or escape of a gas is WATERcalled diffusion.

All around you in himdreds of ways, this process of diffusion is going on. Milhone of motorists, for example, wonder why their tires go down and have to be pumped every so

often, when there are no leaks in the tubes. Diffusion is the answer. Molecules of air are constantly finding their way through the mase of invisible pores in the rubber to join their relatives in the out-

nide almosphere.

Here is a way to demonstrate in a dramatic manner the effect of diffusion. Set up a hydrogen generator consisting of a test tube containing a lye solution into which some pieces of scrap aluminum have been dropped. Now take a small funne, made from the top of a bottle and over the large opening, fit tightly a piece of thin balloon rubber, using rubber bands to hold it in place. Now hold the funnel rubber side up and push the delivery pipe from the hydrogen generator up into the funnel. Allow the gas to flow into the funnel until the air has



THREE EXPERIMENTS IN DIPPUSION OF GAS. At left, flower per, filted with hydrogen and sex ed with arr-tight cardboard and, upper lets, inverted funne, containing hydrogen and closed with subber while at upper right a closed bubb r pipe in an inverted tumbler into which hydrogen to permitted to flow. In the first two cases the gas passed through the cardboard and rubber faster than air can escape and thus cirates a vacuum that causes the water to rise. In the pipe test, the ges, entering the bowl, encreases the presence and moves water in U tube.

been forced down and out around the generator delivery pipe. Then quickly fit a cork, containing a piece of glass tubing, to the neck of the funnel and set up as

shown above, with the end of the tube mimersed in a beaker of water. In a few seconds the water will begin to rule into

the stem of the funnel

MEDICINE

DROPPER

This action is explained by the kinetic theory of gases which assumes that all molecules of gases are in motion. The molecules of bydrogen gas inside the fun nel, being lighter and smaller, move out through the rubber faster than the heavier and larger air molecules can get in through the rubber, so a vacuum is formed within And water rises up the stem to equalize the pressure. Illuminating gas. which contains hydrogen, can be used instead of pure bydrogen gas

A clay bubble pipe is porous and if the stem of the pipe is fitted with a glass U tube by means of a rubber tube, and mounted as shown at upper right, a still

more interesting experiment in diffusion can be performed. The bowl of the pape must be closed by means of a tight-fitting stopper. Invert a tumbler over the bowl of the pipe and hold the end of a tube from which hydrogen or illuminating gas is usuing in the inverted tumbier. The gas will soon drive out the air. It will also go into the pipe by way of the invisible tray boles in the clay,

MOLECULES of air within the bowl of the pipe are also coming out through the holes, but the hydrogen molecules get through so much faster that more hydrogen goes in than sur comes out. Thus, of course, increases the pressure within the pipe and the water in the U tube is pushed over into the other arm. You may omit the U tube if you prefer and thrust the stem of the bubhe pipe directly into water and note the bubbles coming from the end of the

If a miniature flowerpot is used instead of the hubble pipe, the surface available for the diffusion process is greatly increased. Enough pressure will be produced to force a stream of water through a medicine dropper. The flowerpot should be closed by cardboard, using wax. A stopper carrying a tube is fitted into the hole in the bottom and passes into an olive bottle as shown in diagram above. The apparatus should be tested for leaks by blowing into the medicine dropper The experiment will fail if leaks are pres-

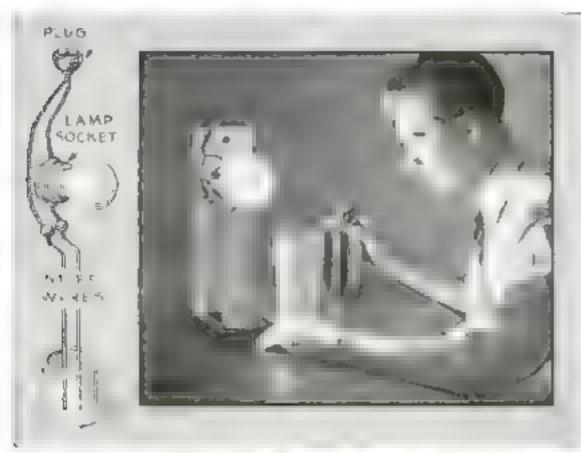
Liquids also diffuse, though more slowly than gas, and the speed varies with different solutions, as some simple experiments show Fill two test tubes with water and into one drop some crystals of

#### Do You Know Your CHEMISTRY?

Before you read this article, see if you can answer correctly the following questions. The answers are given in the text on this and the next page

- I How does air get out of a perfectly good auto tire?
- What is this process called?
- 3 Will anything besides gas act in the same way?
- What is meant by enturation and supersaturation?
- Why does some dyed cloth change color on rainy days?

# for the Home Laboratory



TO TEST AN ELECTROLYTE. With this apparatus it is easy to determine whether a chemical goldston is a conductor of electricity. When acids, a kalles or sales are distinctly when acids, a kalles or sales are distinctly yet or conductor of electrolytic life a cut in samp grows when the water are inserted in a signification of electrolytic

copper suspinate or nickel ammonium sulplinte to produce a highly colored somtion. In the second tube suspend the same kind of chemical in crystal form in a litle copper were basket so that it is at the op of the tube. The crystal in this second the will dissolve and the solution formed will settle throughout the water in the test tube in perhaps a minute or two. If undisturbed, it may take several months for he solution in the first tube to become aniformly colored. At first the dense solution will stay at the bottom of the tube but the colored solution will eventually diffuse throughout the entire test tube by the same process of molecular action that caused the novel effects with gas. Advantage can be taken of this experiment in dissolving quantities of crystals in water Solution was be effected very quickly if the crystals are contained in a bag or suitable perforated metal or glass receptacle at the top of the water

JUST as some chemicals go into solution slowly if conditions are not favorable it has been found that some chemicals come out of solution very rapidly

If chemical solutions of salt, copper sulphate, sugar, or potassium nitrate are allowed to evaporate slowly, the substances dissolved will gather in large crystals. If the solutions are beated to hasten evaporation, small crystals are formed. In either case, when the solution is just about ready to crystallize, the solution is said to be salmated. If more of the crystals can be dissolved in a saturated solution without causing crystallization, the solution is said to be supersaturated, and then a alight jar or juit will cause the whole solution to crystallize almost instantly

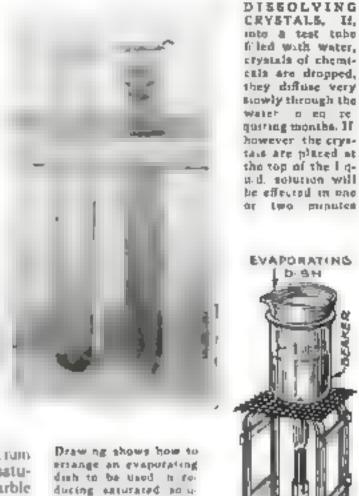
In making carbon dioxide gas using marble chips and muriatic, or hydrochloric acid, the solution which results is calcium chloride. To make calcium chloride. To make calcium chloride show the properties of supersaturation, heat it gently until a piece of marble in it no longer gives off carbon dionide gas. Then remove the marble chip. Continue heating until a thick syrup is formed. Allow to cook to room temperature without disturbing the liquid. If the vessel is now gently twicked after cooking, the thick solution will immediately change to a solid mass of calcium chloride crystals. The crystals will become exceedingly

warm when this happens.

Practical use is made of this fact in some of the chemical heat bottles and bags. Crystals of photographer's bypo sodium sulphate, sodium acetale, or ferric nitrate when heated without water in a flask of beaker become liquid, and finally syrupy. In this condition they can be made to crystallize out immediately by shaking or by adding a small crystal of the substance. In some cases the crystallization is slow, but fast enough to watch the crystals grow. Sometimes the growth is an inch a minute

WHEN crystals are dissolved in water the solution will exhibit a variety of properties. If the crystals or solid is an acid, an alkali, or a salt, which is the product formed by the reaction between an acid and an ulkah, or base, then the solution formed in water always is a conductor of electricity, and is said to be conised. A simple apparatus to distinguish electrolytes from nonelectrolytes can be made from a lamp, mounted on a board and connected to the house lighting system. Drawing and photograph above show the arrangement. The lamp will light when any conductor is placed across the two stiff copper wires, which are mounted

By Raymond B. Wailes



on the board and which can be dipped into a small vessel of solution to be examined.

ties to syrupy condition

Dipping the ends of the wires into solutions of copper sulphate, salt, potassium mirrate acids, alkalies and similar chemicals will cause the lamp to light. Some solutions will cause only a faint glow Use the same amount of substances and water when experimenting. Interesting tests can be made on alcohol, sugar solution, distilled water, vinegar, soft drinks, and also on dry sait or sugar

AN IMPORTANT property of solutions is their strong tendency to remain in the liquid state. It is for this reason that solutions have higher boiling points and lower freezing points than the solvents from which they were made. Honey-a simple solution of sugar and other substances in water-for instance, may be exposed to the sir almost indefinitely without evaporating, while water under the same conditions will soon disappear completely Similarly, sea water, another solution, remains unfrozen while fresh water cooled to the same extent will become covered with ice. It is this property of solutions to remain in the liquid state that makes it possible for us to melt ice by sprinkling it with soit and to test milk for the addition of water by carefully determining its freezing point.

The parts of a muxture can often be separated by taking advantage of their difference in (Continued on page 86)

#### ELECTRIC CLOCK SPEEDS FARM AUCTION



Electric "clocks" are now used in Germany to speed up farm auctions Wagonloads of produce are displayed. Then the buyers take their places in stalls, and the auction begins. As each load is put up for sale, the hand of the clock starts moving from 100 downward.

indicating the sale price. When the price is satisfactory to any buyer he pushes un electric button that stops the clock's hand. If the hand reaches too low a figure, the owner may push a button flashing the words no sale."

#### FISH LIVES IN SFALED GLOBE

SYARED in an our-light globe, a goldhish recently lived for three months at the North Dakota Agricultural College at Fargo. When the globe, water plants were fed by the indicate given off by the fish and producting the fish at the plants.



Steam shovel oprouts trees and swings them out of read builder's way

#### USE STEAM SHOVEL TO UPROOT TREES

During the building of a read near a Chesapeake Bay sum ar reserve the problem arose of trees. Or many methods of cutting hem down and removing the stamps would have delayed the work so the contractor used a

powerful at ear's shovel. With this he approved the trees bod by to be delight of numerous spectators. Moreover the holes left by the improvised free puller were said to be smaller and to be quire less f ling-in than ordinarity would have been the case.

# Cash Prize WINNERS

in our July

Heroes of Science

Contest

Here Are the Names of Twenty-Nine Whose Skill and Application Brought Them Cash Rewards in Our Big Picture Cutting Contest in July Issue

FIRST PRIZE \$500

Earl Sargent, Atlanta, Georgia

SECOND PRIZE \$100

Elwin C. Leslie Lakewood, Okto

THIRD PRIZE \$50

Hester K. Sunford, Floral Park, N Y

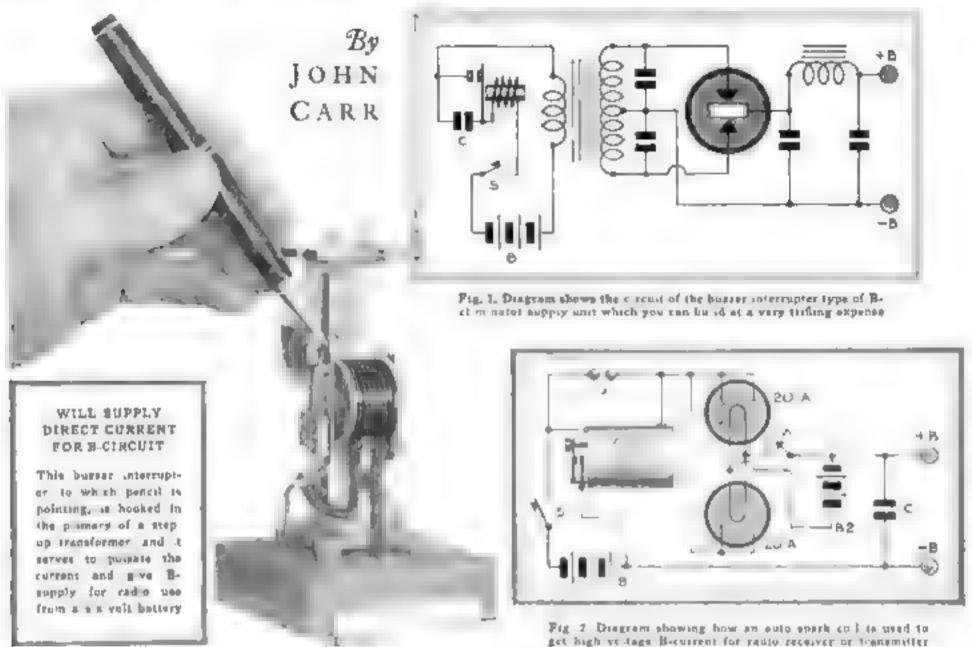
SIX \$25 PRIZES

Jean Allen, Blaskington, D. C. M. Chase Cooke, Los Angeles, Calif. Charles Held, West Toledo, Ohio Marya C. Hicks, Chicago, Ill. C. E. Madden, Port Worth, Texas Charles W. North, Glenbrook, Conn.

#### TWENTY \$10 PRIZES

Limer B. Benson, Moline, Itl. W. M. Boyle, Bakerstown, Pa. I. Caclaudie, Arbury Park, N. J. H. Castleberry, Legion, Texas A. F. Conton, New York City. Albert E. Copper, Philadelphia, Pa. Henry Dammeyer, Indianapolis, Ind. John H. Richardson, Ridgewood N Y Jay A. Davis, St Helena, Calif. Lela Engle, South Bend, Ind. David Feizer, Hankegan, III R Geiler, Pettsfield, Mass C. W. Glenn, Jackson, Michigan Charles Gray, Brooklyn, N. Y. John L. Moore, Ortega, Fla Bryan Hadley, Clayton, Ind. A. G. Kalmbach, Grand Rapids, Mich. Charles H. Kahn, Indianapolis, Ind. Ethel Milispaugh, Anderson, Ind. John Perry, Glen Lack, Pa-

# B-current for Your Radio



set an adequate supply of high voltage, in tered direct current for B-circuit use.

The most obvious solution is heavy duty, dry cell B-batteries, but there are other ways to get high voltage direct current that can be filtered or smoothed out for radio B-service on receiver or transmitter

There is, for example, the small dynamotor set that draws six-volt current from a storage battery and generates a supply of current at 180 volts (P.S.M., July '32, p. 63). This unit, including the necessary filter circuit, is complete in one small case. For automobile use, where the storage battery is kept charged by the car's generator, the dynamotor is excellent, Also, it can be used on farms equipped with thirty-two-voit lighting systems.

Another new form of B-supply designed to run on a six-volt storage battery, employs a buzzer circuit breaker in connection with a step-up transformer and a rectifier tube. It will prove praction on any service where the dynamotor unit can be used to advantage. The buzzer circuit breaker is shown in photograph above, removed from its sponge rubber aned case. The heavy sponge rubber lin-

sound of the vibrator

The vibrator interrupter or buster breaker type of B-supply circuit is shown at theoretical form in Fig. 1. It works because an interrupted or pulsating direct current has about the same effect on an alternating current transformer as does real a ternating current privided the rale of pulsation roughly corresponds to the frequency for which the transformer is designed.

The rate of make and break can be regulated by the length and stiffness of the steel spring armature. Condenser C is important because, without it, the breaker points would soon burn away It should have a value from one-half to one microfarad. The set-up transformer must be specially wound, as the power transformers usually available have a primary adapted to one-hundred-and-tenvolt supply, and would not be usable on six-volt current unless rewound

Another way to obtain bush voltage B-current from a low voltage direct current source is shown theoretically in Fig. 2. An automobile ignition coil of the vibrator type is operated by battery B-1. A couple of 201A tubes, connected with their grids and plates in parallel, serve to rectify the high tension current. The filaments of the tubes must be supplied from a separate battery. B-2, because

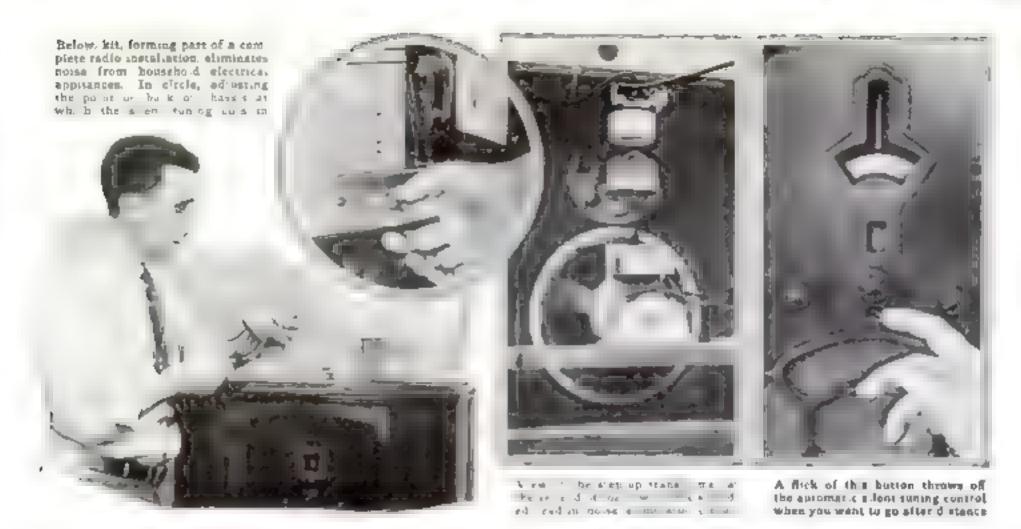
everything connected with the tubes is at high voltage with respect to the other battery, B-1, and the minus B sine of the line.

The B-supply systems of both Figs. 1 and 2 should be particularly interesting to amaleur radio operators who live where no electric light current in available

E ther system can be used with a lowpower radio transmitter. The interrupter operated B-supply of Fig. 1 is technically more desirable because it will give a more salisfactory output and is more economical of current. The chief difficulty with the spark coil supply of Fig. 2 is that a spark coal is not well adapted to this work. The secondary is wound with many turns of fine wire and the secondary output develops several thousand volts more than voit need. This excess voltage is wasted, Spark gap G should be set so close that any sudden voltage surge will cause current to flow across the gap and thus save the tubes from overloading.

A gaseous type rectifier tube is shown in Fig. 1. It is possible to use such a tube in place of the two 201A tubes in Fig. 2 and thus save the use of the extra bat-

For a small portable transmitter, the spark coil can be operated with flashight cells and the current rectified with a gaseous tube. This will reduce both the cost and weight (Continued on page 98)



# New RADIO SETS Tune

F YOU have never turned the turing knob on one of this season's radio receivers, you have a new seasonion coming to you

Last manch I discussed the various circuit improvements of the latest sets. They are important, because they insure bet er ratio performance but they seem almost insignificant when compared with the strides made in radio control. In this respect, radio has closely paralleled the development of the automobile. Where formerly we had to crank the engine and learn all sorts of tricks in order to change gears quietly, we now have automatic starting, alent shifting, free-wheeling, and other features that take all the hard work out of auto driving.

Now, in ratio, we have automatic volume control, automatic tone control, visual tuning, manual silent tuning, automatic street tuning, house elimination, and other features to make the radio receiver so easy to handle that even a baby can tune the set and tune it right

If you have a radio set that is more than two years old, you know that when you tune through the broadcast range, one station may come in with a roar that hearly spiits your eardrants and the next may be nothing but a faint whisper, while in between the stations, there will be the steady anapping and marking of static

With any old-time set, this result is inevitable. The intensity of the signal from different broadcasting stations, even semi-local ones, may very as much as one to a hundred thausand or more at your antenna. No matter how you set the ordinary hand volume control, you can never hope to get more than one or two stations at the right volume without readjusting.

Automatic volume control, on which many of the other new features depend,

has been experimented with for several years. Last year it became an accepted feature, although it was not fitted to all sets nor did it function any too well on some of the sets that had it. There are various methods of obtaining automatic volume control. All work on the principle of using the strength of the incoming carrier wave to vary the sensitiveness of the radio or intermediate frequency amplifier stages of the receiver. The stronger the ancoming carrier wave, the less the receiver amplifies, and the weaker the incoming wave, the stronger the amputication

In theory, this system should bring in all stations within the local and semilocal range of the set at precisely the same volume. It is not quite that bearty perfect, however, because there are differences in the degree of carrier modulation—that in, in the ratio of carrier wave to aound vibration strength. This variation is rapidly becoming less and less as the weaker stations improve their equipment. In any case it is not likely to be greater than one to four, comparing the best equipped station with the worst heard in any given locality. A change of volume in the ratio of one to four seems triding to the human ear and amounts to nothing as compared with the tremendous variation found in sets without automatic volume control

WITH such an arrangement, it is obvious that the set is operating at maximum sensitiveness when no signal is being received. This would result in a dealening roar of static at points in between stations. In early models incorporating automatic volume control, a button was provided to cut out the loudspeaker while tuning. Now we have automatic silent timing. You hear nothing at all between stations. The sensation of tuning a modern set seems almost weird to the

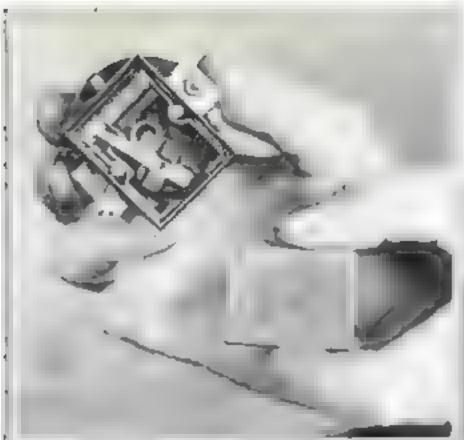
old-time fan accustomed to rearing static and any old volume level

The method by which the static between stations is choked off is extremely ingenious. The carrier wave is utilized to operate either a mechanical relay or an electrical equivalent of it, which cuts out the speaker or "kills" the automatic amplifier end of the set when the carrier wave strength fails below a certain minimum. This minimum can be adjusted, usually by a separate small knob at the back of the set, so that any station that can be heard through the normal static level will cut in or "turn on" the amplifier or speaker

THIS combination of automatic volume control with automatic silent tuning (sometimes aughtly different terms are used to designate these functions) is ideal for the average radio user who wants maximum enterlainment with minimum trouble

It does not, however, suit the ardent radau fan who likes, now and then, to gu hunting for distant stations. It would be inconvenient if you had to adjust the silent tuning control on the back of the set each time you wanted maximum sensativity for distance fishing, to a simple throw switch on the front panel, or some equivalent set-up, is supplied. This permits cutting in or out the silent tuning by a flick of the finger. Minus the affent tuning, but with the automatic volume control still on the 30b, the set becomes ideal for going after the faraway weak stations. You get no thunderous roar when you happen to pass through the setting for a powerful local station.

la some of the sumpler sets, manual silent tuning is employed material of the more elaborate automatic variety. In these less expensive models, a button must be



View of the automatic control that governs volume. A siny gear. On the end of the courts shall moves the against resistance current arm to change the fet a tone quality to be the human ear

# Themselves

pressed while you are tuning to get the sitent effect between stations

Visual tuning, which substitutes an accurate setting by eye for the uncertain and usually inaccurate tuning by ear, is now a feature of about seventy percent of the new tecesvers. Several makes of acts use the cambing neon light which shows by the height of the red glow when the set is precisely in tune. Others use various forms of meters, the position of the indica or giving the same information.

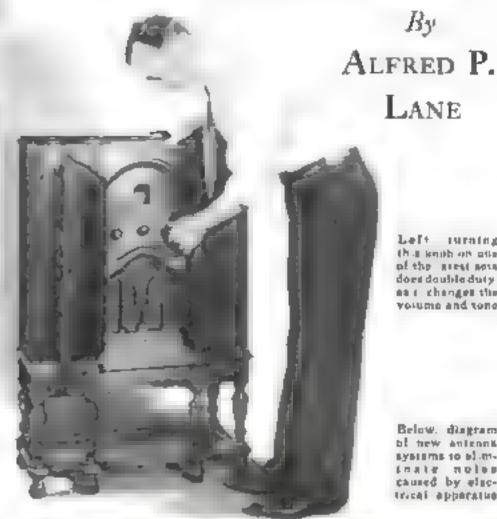
Automatic tone control, also called tone compensation and other names, is incorporated in some of the latest receivers.

It has been known for some time that tone reproduction approaching theoretical perfection does not sound exactly right to the human ear unless the volume from the speaker equals the volume actually produced in the broadcasting studio. At anything less than studio volume, the effect on the ear is as though a soft pedal had been appued both to the higher frequencies that make speech understandable, and to the lower frequencies that form the

There are few occasions when the radio user wants studio volume in the home, and as a result the best old-time sets were in effect, giving distorted reproduction most of the Line

AUTOMATIC tone control compensates for deficiencies in the human ear When you turn down the volume on a set baving this feature, the relative strength of both the top and the buttom of the tone scale are increased with respect to the mudle register. The volume control knob on the front of the receiver therefore turns, in addition to the volume level potentiometer, a switching or resistance arrangement that produces the desired change in tone characteristics.

Knob Twisting to Get Right Volume and Tone Is Unnecessary with This Year's Noise-Eliminating Receivers



Left turning this knob of alle of the great seas does double duty

on a changes sho volume and tone

 $B_{5'}$ 

LANE

Below, diagram bi new antenna systems to silmthate notes caused by electrical apparatuo

The elimination of unwanted nuise in radio reception always has been the goal of radio en-geneers. So far, no way has been found to get rid of natural static except to increase the strength of the broadcasting This has been done to the point where local and semi-local stations give satisfactures horsefree results from your speaker This is unfortunately not true with regard to man-made static the noise forced out of your speaker by a thousand and one types of small household electrical appliances.

T HAS been known for several years that a high, and relatively long, outdoor antenna brings in more broadcasting. with relation to the man-made statec picked up by the lead-in

and the set itself than does a short indoor or loop antenna. That is why the loop has disappeared and the indoor antenna is used only when unavoidable. Carefully shielding the set and using a shielded lead-in belps, but the shielded lead-in defeats its purpose by cutting down the strength of the radio impulses

A way around this trouble has been found and we now have systems that cut out nearly all the man-made static. The diagram shows variations of the latest thing in noise elimination. In operation, a high-frequency, step-down transformer attached to the antenna feeds the radio signals down the shielded wire at much lower voltage. At the set, they are stepped up to the original voltage by another high frequency transformer. The secret lies in

. T. D. of Synta The Jones D. LEAD SHIELDED INTERNA LEAD-IN STEP-UP TPANSFORMER

> the fact that the losses due to capacity in a shielded lead-in are far less at lower

> The double shielded lead-in system has the advantage of center-tapped low voitage windings. This halves the effective voltage with respect to the shielding. A system like this is sold only as part of a complete radio installation.

> AS A result of all these changes and improvements, the sets this fall are more selective than ever, with a more faithful reproduction of tone quality. However their most distinctive feature, probably, is the case with which they are manipulated—a characteristic that will make a strong appeal to the vast majority of radio broadcast listeners.

### How Car's Ammeter Can Warn of

Ignition Trouble

By MARTIN BUNN

ANT to make a milaon do lars?'
Gus. Wilson, veteron auto mechanic
and balf owner of the Model
Garage, pulled his bead from
unuer the hood of the car on
which he was working

"Hedo, Pete," he said "What's

the big idea now?"

Peta D'thow glanced furtively about over the tops of his spectacies. "You're going to be out of a job soon!" he announced impressively. "All these cars are obsolete. They'll go straight to the junk pile soon as I get some of the little details of my latest invention worked out. It is a new kind of automobile that doesn't use gasoline. I thought, since you're in this business, maybe you'd go in with me for about a tenth share. That would bring

you at least a million and maybe ten times that much, if we're lucky."

Gus had been offered shares in Pete's

inventions many times, but nothing had ever come of any of them

"Sounds important, Pete," Gus told him.

"Tell me about it."

At that Dilbow drew out a neatly folded sheet of brown paper and spread

it out in front of Gus

"Here," he explained, "is the design of a new kind of automobile. Learning how an ordinary car works, I had a wooderful idea. Instead of using a little motor to start the engine, I put in a motor hag enough to run the car, then I put in a big generator or dynamo and a large size storage battery. The current from the battery runs the car and the dynamo keeps the battery charged. What could be simpler than that?"

"Sure is one grand idea, Pete," Gus



"fr's a new hind of automobile that doesn't use gasoline. It would bring you in at least a million," Dilbow explained. "Sounds important," Gus seld. "Tell me about it."

chuckled. "There's only one trouble with it. It won't work."

"I'd like to know why not," Dilbow

demanded

"Well," Gus explained, "if it did work, that would be perpetual motion, and there isn't any such thing."

"Wouldn't this motor drive the car?"

Disbow asked.

"Certainly," Gus agreed. "Until the battery ran down if there weren't anything else to stop it."

"Wouldn't this dynamo charge the bat-

tery " Dilbow insisted.

"It surely would if you kept it spinning at the right speed," Gus admitted.

"Then," snapped Dilbow, "what do you mean by saying the idea won't work?"

"For the simple reason," Gus explained.
"that electric energy is just like water
power or steam power or any other kind
of power. It takes more power to pump

water up hill into a tank than you can get back again by letting the water run down through

a turbine.

"What do you think would happen if you made an auto like that drawing. When you turned on the juice the car would start because current would flow through the motor, but if you put in a dynamo or generator beg enough to make as much current as the motor uses, it would

take more power to drive it than the motor would produce. The car would start all right but the minuse the genera or cut in, it would stop as though you'd slammed on the brakes."

"If that's so," Dibow interrupted "then how do they get away with such small generators on automobies? Isn't that generator," he added, pointing to the one in the car on which Gus had been working, "as small as the self-starter and doesn't the aelf-starter motor have power enough to turn over both the engine and the generator at the same time? And doesn't it keep the battery charged?"

"Listen, mister," Gus said, "you can't judge a book by its cover. And you can't judge bow much power a generator will take or a motor will give by its aux

"The self-starter motor on a car is a specialized job. It has to develop as much as a half borse power or more for just a few seconds of time and it has to do it on only six volts of electrical pressure To get that result, the armature is wound with solid copper bars and the field with a few turns of heavy copper ribbon. Then there are four copper brushes with a wide commutator. When you press the starter button, the puce flows through the starter motor in a regular flood. Maybe as much as three or four hundred amperes go shooting through the starter motor windings for the fraction of a second it takes to 'break loose' a cold engine. Even after the crankshaft starts to turn, maybe seventy-five to a hundred and fifty amperes keep on flowing until the ignition takes hold. No starter motor could stand that load for long. The only (Continued on page 101)

GUS says:

Because a spark plug has fine insulation, clean cut threads, and simple spark points, it does not follow that it will give even fair results in your car. What counts is the design of the plug. Some plugs are made to run hot, others medium, some cold. Put a cold running plug in a cold running motor and it's sure to foul if there's the least bit of excess oil. Put a hot running plug in a hot running motor and you get pre-ignition knocks. Sometimes if the cylinder and rings are in good shape, plug fouling is cured with a hotter running plug.

BETTER SHOP METHODS: IDEAS FOR THE HANDY MAN: BLUEPRINTS



MODEL MAKING: HOME WORKSHOP CHEMISTRY: THE SHIPSHAPE HOME



RIVEN by three sets of rubber banca, this little motorboat hu l-a scale model of the Popular Science Monthly Vagaband-attains an astonishing speed. It planes on top of the water exactly like a large speed boat and skims along for more than 100 ft

When powered by a spring-operated toy model of an outboard motor such as that shown in the diastration at the right it will run about 200 it at a speed of

from 4 to 5 miles an hour The half is a 1/4-in scale model of the 13-ft. Vagabond, a combination rowboatmotorboat that many readers have built with great success (P S, M., Mar '32 p. 75, and Apr. '32, p. 82). The over-all length is 19 11, 16 in., the extreme beam 634 in., and the weight 834 os. If a rubber band motor is used, either two or three sets are required, and these should consist

of seven strands each. The framework should be constructed of spruce, and for the planking material use clear 1/32 in, white pine, cedar or mahogany. The bottom may be pine or

cedar, and the sides and deck mahogany Draw full aize paper patterns of the frames, transom, and stem, then mark and saw out the frame ports. Lay the frame material on the potterns so as to conform to the outline, and glue together with waterproof casem glue or a quick drying nitrate base cement.

The completed frames are next notched for the keel, chines, and inwale. The stem-



This trim looking, apeady listly model is al-ghily less than 20 in long and 644 in. In actreme beam. It weight only 61, or and may be driven by a toy purboard motor or by rubber bands

correct spacing for the frames

It is necessary to make a form on which to assemble the framework. This form is shown at the bottom of the drawings on page 62. When it has been set up in a convenient place to work, fasten the keel temporarily to it. The various frames are then glued and fastened from the inside to the keel with one ½-in, brad to each frame. Be sure to level and line the frames up before the glue sets.

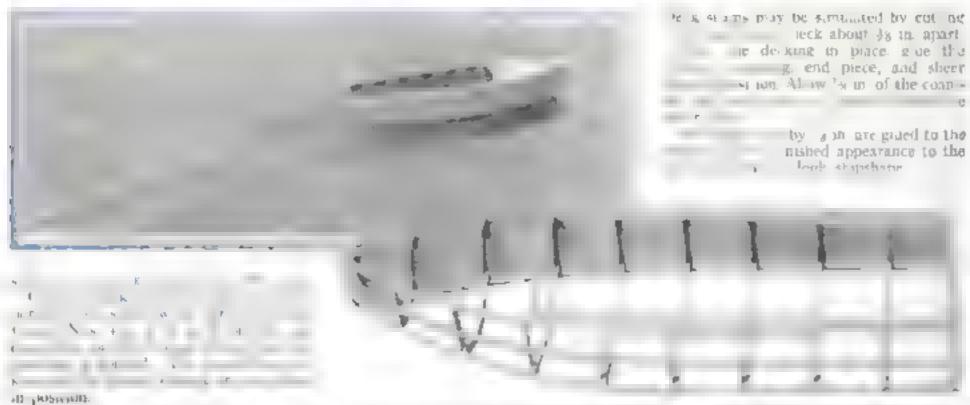
Starting at the transom, give and pail the chines to the frames. Drill lead holes

is glued and attached to the keel with for the brads. Fasten the chines on both two 1/2-in, brads. Mark on the keel the sides simultaneously. Spring clothespins make excellent clamps to hold the parts in place until the glue dries. The the chines together at the stem until the glae is thoroughly set

> The inwales are next glued to the frames, but make sure first that the frames are properly lined up. The after and forward ends of the inwales are glued and nailed with 3/2-in, brads

> The forward motor hook is bent to shape from 1/16-in, brass rod. Drill the stem and insert the book as near the top of the stem as possible. Embed the aut-

#### HOW TO CONSTRUCT OUR "VAGABOND" IN MINIATURE



The apper view was anapped when the model was speed ng along under the power of the vulber head moter. The other photograph shows the standing. Note the better to the aide planking

The planking on the original full size loat was divided into three strakes on each side, and eight strakes on the bettom. To simplify matters, the model is constructed with one 1/32 by 34-in, batten on each sule, and two battens of the same size on the bottom. These are carefully notched into the frames and glued

The side planks are each attached in one piece, but the bottom planks in four pieces. While the 1/32-in, planking is thirenough to bend easily, it is best to souk the pieces in hot water and bend to the required shape as accurately as possible by hand. When dry, gase the planking to the framework

Flank the sums first; then remove the

hull from the form and excelutly term the projecting edges flush

On the bottom begin by gluing the two planks nearest the keel. These are cut to shape so that the seams will meet in the center of the bottom batters. Soak the bottom planks in hot water and shape them by hand before gluing

fidl any defective spots in the seams with a plastic wood composition. Sand the hull smooth and apply two or three coats of varnish or lacquer inside

Glue the 1/32-in, decking to the deck in two pices, with the seam in the center.

A false outer how stem 1/16 by 1/4 in if soaked in water and bent to shape to as to fit the outer edge of the bow, This piece covers the bow and the edges of the planking at this point

Paint the hull below the water line bright green, and make the 1/4-tn, bootlopping white, striping it on as neatly as possible. The remainder of the hull is then varnished. Rub with fine aundpaper between coms.

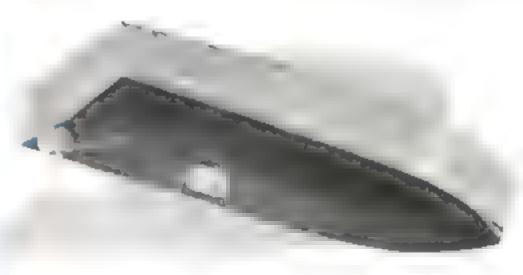
The gear drive is built as indicated on the plans, or the gear assembly may be purchased from a model airplane supply



Complete working drawings for a tirm, scale model of the 13-ft Vagabood, one of Popular Science Worthly's best known outboard matorboard. The frames should be laid out full size on paper so that the parts can be out and assembled accurately. The gear drive can be bought, if desired

#### FRAMED AND PLANKED EXACTLY LIKE THE ORIGINAL





The underside of the bull showing propeller and radder and, at left the genes and sudder control from above. Compare with the details on page 62

house. The gear assembly is fastened to the keel with one 5/16 by 1/6 in, machine bolt. The rudder assembly is similarly bolted with one 1/2 by 1/6 in, machine bolt

By studying the drawings carefully and doing the work with painstaking attention to every detail you can learn a good deal about boat building as you construct this little model In fact, as you progress with the assembling, you

will find that it follows closely that of the full size i agabond. Indeed, the operations are essentially the same, only on a larger scale.

You will find it interesting to look up the March and April, 1932 numbers of FORULAR SCIENCE MONTITLY, if you keep a file of back issues as so many home workshop enthusiasts do. The photographs on page 77 of the March issue will show you how the framework for the full size boat was set up, and the illustrations which are shown in the April issue will give you a good idea of the method of planking the hull,

#### Space-Saving Table and China Closet for Small Kitchen

For small apartments or where space is limited, this combination kitchen china cabinet and breakfast table will find favor. It was made of 13/16-in, clear white pine in a home

workshop where the only special machine was a jig saw. The dimensions of the cabinet itself—the box part fastened to the wall—are 12½ by 30 by 36 in.; and the door of the cabinet, which forms the table when let down, is 30 by 35 in. The back is a sheet of ½-in. plywood screwed securely to the frame and shelves. The cabinet is fastened directly to the wall 29 in trom the floor, giving the right table height

The catch used is of my own invention and serves both as safety ch for the left when down and a sk for the door when the table is a sed to close the cabinet. To rebe catch when the table to the leg is rawn out, and the table comes.

The leg is then pulled out it right angles to the table top, and the safety catch snaps into place making the table leg secure. To close the tablent, the table is raised slightly and the catch pressed to one side

whereupon it slides into the slot through the table. The table is raised to a vertical position against cabinet, but the end of the leg is held away from the top a few inches. Then, when the table is against the cabinet. the leg is pushed against the underside of the table top, thus locking the cabinet and drawing the top tightly into place to

serve as the cabinet door. This hooking arrangement, which is entirely out of sight, is a puzzle to the uninitiated

The inside is orange enamel, the shelves table, and outside are a light green enamel, and the edges of the shelves, table, and table leg, black enamel. If desired, the top of the table could be stendled or decorated with transfers.—A. C. Johnson,



SAPETY BACK OF CABINET PLYWOOD SO'x \$6" H N SED LEG 126 TABLE (COWN) PROPER MEW OF CABINET PLOSE SAFETY CABINES EATEN FASTENED SECURELY TO WALL SJOA TABLE (up) THOLE (DOWN) PLATE Hillian HINGES SIDE WEW OF CABINET (OPEN) (QOSED)

leg firm when the table is down and boids the top up

when the supboard is shut

#### Bench and Tools Hidden in Carved Cabinet



FOR use in an apartment or wherever a sace is restricted, a unique, compact author ute for a workshop can be made by adding a folding bench top to a tool cabinet of standard design such as has been described before in Pupular Science Monthly. With a little extra work the whole cabinet can be given the appearance of a decorative piece of furniture.

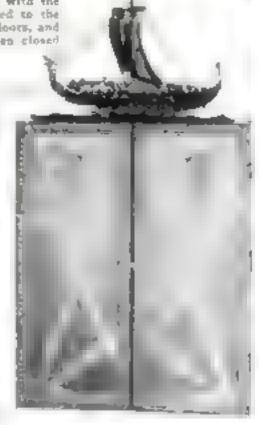
The bench top, which is \$\% in, wide and 48 in, long when open, is sufficiently large for the average job done in the borne. When folded, it can be stored in the cabinet. Each half of the top is made of three pieces of 1 by 2\% by 24 in, white pine fustened with cleats, as indicated in the accompanying drawings. The two halves are joined by means of two heavy 3-in, steel hinges. Two cleats 6-in, long are hinged to the front for fastening the bench top to the cabinet doors with clamps as shown in one of the photographs. If preferred the bench could be attached to the

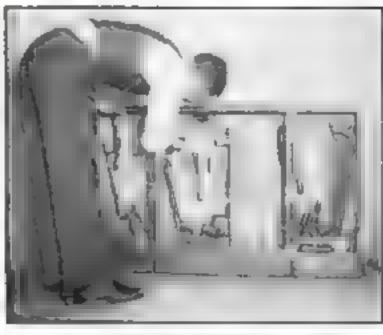
### Our BLUEPRINTS Insure Success

BEFORE you begin to build any project whatever in your home workshop—whether it is something described in this issue or not—look up the list on page 80 to see if blueprints are available. If they are, take advantage of them,

Our blueprints cover many subjects, and they are all large, clear drawings so carefully detailed that it is a pleasure to use them. In many cases the parts are shown full size,

The drawings that appear in the magazine have to be sharply reduced both in size and number to fit the limited space available. For actual use at the bench, therefore, our blueprints are much superior. They will do more than any other one thing to insure your success.





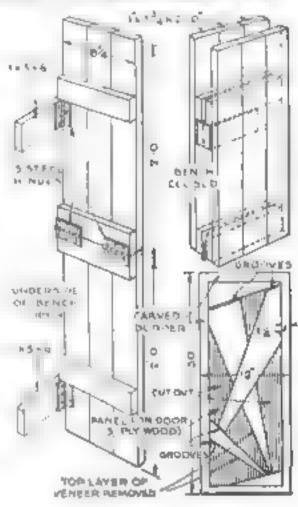
The folded top is stored away inside the center compartment of he cabinet Below Drawings of the top and a suggestion for making the ernamental door panels

top of the doors with bolts and wing nuts. The cabinet itself is of oak. To make it more omamental, additional papels of thin three-ply wood were cut out as in one of the drawings and glued on the doors to give a carved effect. To set back some of the converging rays, certain parts of the panel, it will be seen, were cut away entirely with a scroll saw. Geometric designs were then carved around the 11/4 in, wide borders of the panels, and the top layer of vencer was shaved away from all the remaining surface within the borders, giving a distinctly hand curved effect of a rugged or antique type. The top and sides of the cabinet were further decorated by cutting

well-spaced lengthwise grooves.

When the cabinet was ready for painting, an effect of light and abadow was obtained by rutibing off much of the stain on the higher parts.

One of the photographs shows the finished cabinet closed, with a model of the POPULAR SCIENCE MONTHLY VIKING ship on top.—CARL JULIAN VETTER



#### STAND SUPPORTS MAGNIFYING GLASS



The magnifying glass stand in use and, at night, a aberth of the simple clamping device

This stand was designed to support an ordinary magnifying glass steadily and at the correct height for viewing any small object. It is also an aid in taking photos through the magnifier

No changes are made in the glass or its bandle, and it may be removed in a second's time. A piece of tubing or pipe 2 in, long and with an inside diameter equal to the diameter of the glass handle is used to hold the instrument. A 36-in, hole is drilled through the tube near one end to slide on the 36-in, vertical rod, and a set



screw holds it at any height desired. Another set screw secures the handle of the instrument in the tube. The base can be made up of junk-box parts in any way desired.—
W. C. Wilherte,

DISTINCTLY novel in design, this night lamp resembles a miniature lighthouse, and when it is picked up a homemade automatic switch in the base causes it to light. To make one like it requires only an inexpensive pocket flash light, a tin place, and a few other small parts

Obtain a flash light using the smallest size dry cell. Make over the bulb end as shown in the accompanying trawing by cutting off the top, soldering on a washerlike copper disk, and soldering the socket into the disk. Cut a hole in the bottom of the flashlight case and install an automatte switch made us shows. The 1/2 in, thick disk of hard fiber should be just large enough

to fit in the base of the flash light, while the round brass spring should clear the edge of the cut-out hole by 1/32 m. when riveted in place, Remove the side match regularly furnished. If the flash light has a fiber tube, golder a copper wire or strip connection between the top and the bot-

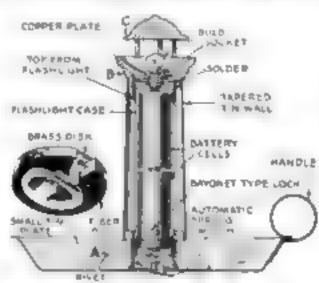
tom metal parts.

The wooden parts, A, B, and C, can be made easily in a lathe, or they can be shaped without difficulty from pine with a sharp knife and a file. The supports for the roof are firmly set in part C, but make a plicing fit in the holes in part B so the roof may be removed to change the bulb

A round hole is cut in the 6-in, tan pie pan or plate for the switch spring to pass through, and a 1/2 in, wide handle is soldered on. The part A is then attached wasts brade.

For the "walls" of the lighthouse, prepare a very slightly tapered cone of tin and frim the shoulders of the wood parts to fit. This part can best be made by first

gh having the amaliest 3 z(1 tg: 4 z). hidden behing the painted tin walls of this hay model of A 医抗剂的压缩的 The lamp, the automatic eventals, the were to be and top. How they are pasentle ed to thouse an the drawing below



This Little Night Lamp Lights When Lifted

whittling or turning a lapered wood (ormand cutting a piece of lightweight lin to fit around it exactly, the edges meeting in a butt joint. Wire the tin around the form solder the joint, and file off the excess solder and wire. The 1m may then be slipped off the wooden form. Brad the top of this tin casing securely in place, but key the bottom with a fastening of the hayonet socket type, as indicated, so the cells will be accessible for changing them

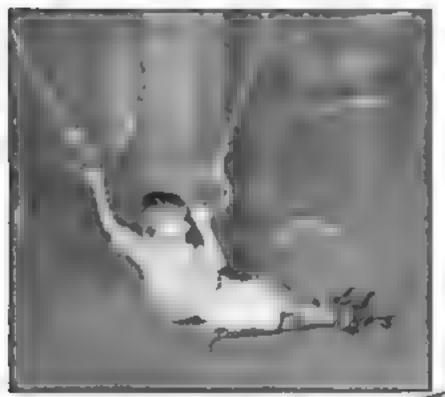
Ал пености ус

n be fash

Assemble the parts and adjust the apring so that the weight of the lamp will break the contact it makes with the rim of the metal piece at the bottom of the flashlight case and thus put out the light, When the lamp is picked up, the spring again makes contact and completes the circuit through the dry ceils and built

Paint the casing white and the base and other wooden parts green or brown, The windows and doors are painted with black enamel, while the fin plate with its handle are given two coats of copper colored bronze" paint. If a muall quantity of luminous paint can be obtained from a jeweler or watch manufacturer, a little may be applied near the bandle to make the lamp easy to locate at night.—E. A.

#### SKĀTE TRĀPĒZĒ GIVES BOYS EXERCISE



It takes more skill than it looks to opera e this amusing exercises, but an occasions, apr., only adds to the gest The boy who thought of this device is the eight year-old son of J. G. Prain of Washington, D. C. a regular contributor and one of the greatest experts on photomicrography

THIS muscle building and fun giving pastime requires merely a "skatemobile," minus the proverbial scapbox, and a couple of hand rings paspended from the floor beams in the basement Seat and foot rests are attached to the coaster The game consists in slading the coaster backward and forward rapidly from one ring, and then catching the other ring and repeating the whole operaion.-REEVE PRATE



#### REMOVING ODORS FROM A VACUUM BOTTLE

AFTER it has been thoroughly washed, a bottle of the vacuum type for keeping liquids bot or cold can be freed from any slight sour odor that remains by dropping one or two crystals of potassium permanganate into it. By oxidation, the crystals will "sweeten" the bottle, but it should be washed again before being used.-R B W.



in 201/2 in, high and 123/2 in, wide over all. However, the same design can be used within reasonal le limits for a larger chair simply by increasing the dimensions

In constructing the chair, the writer used 1/2-in, five-ply wood for the sides and seat and a piece of 34-in, solid stock for the back, but 35- or 1/2-in, plywood can be used throughout if desired. If solid stock is used for the back, plan the outline so the grain runs crosswise

First, lay out full size 4-in, squares on a large sheet of wrapping paper and sketch in the outlines of the cat, cat's head, and seat according to the drawings below Transfer the enlarged outline of the cat

to one piece of plywood, place this on top of the stock for the other side and drive thin brads in the scrap areas to hold the two

pieces together By doing this, both cats can be sawed out in a single operation

When all the outlines have been transferred to the stock, drill bolen in the icside scrap to take the saw blade for the start of each cut. In sawing the outlines of the sides and back, shift the work slowly from one side to the other to give the finished pieces an irregular furry ap-

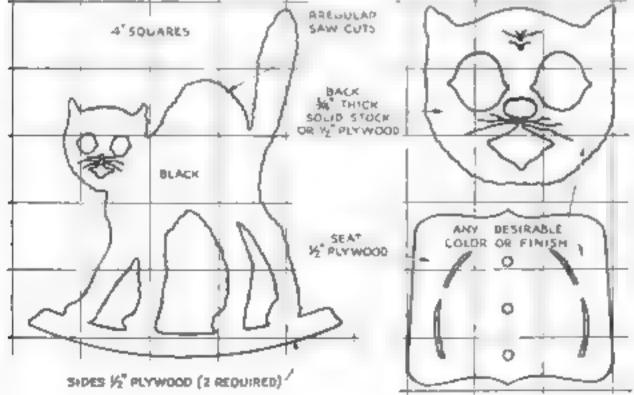
pearance. The whokers on each cat can be formed by making single-width cuts,

In making a small chair of this type, sufficient strength can be obtained if it is assembled with glue, screws, and four angles—the screws being used to hold the back in place and the angles being used to support the seat. If mortise and tenon construction is desired, allowance for two lenons on each side of the back and sent should be made when cutting the stock. Since a light fit is important, make the tenons slightly large at first and then trim them to fit the mortues cut in the aides

With the exception of the two cats. which look best painted black, the question of finishing is a matter of personal preference. In contrast to the black sides, the writer found a red back and seat to be effective. Two coats of paint, one before assembling the parts and one after,

### will prove sufficient HOW TO GIVE WOODWORK A CRACKLE FINISH A cozonen "cruckle" finish similar to

that found on some metal cameras can be given to wood by applying a entirentraied water solution of magnesium sulphate to which coloring material and suffiment dextrme to give it the consistency of varaish have been added. The solution is spread on with a brush and on drying forms mto beautiful crystals. If the wood is extremely purous, it should first be given a coat of gine size.-K. M.



To prepare full size patterns for the parts, lay out two groups of 4 in aquates on a large sheet of wrapping paper as shows above and copy the three designs carefully, agence by square

### COSTLY LOOKING

# Modern Book Ends and LAMP

Made from Copper and Brass



These unique book ends and the equally distinctive lamp are an example of what can be done in the home workshop with inexpensive materials. The end table, too, is homemade

AKEN in the plain form in which they come from the mill, ordinary copper and bross plates, bars, and sheets lend themselves readily to the fabrication of articles of modern design with a minimum of cutting and shaping

The pair of book ends illustrated are each made of three flat plates and three bars. The bottom plate is 36 by 3 by 4 1/2

in.; the plate resting on the bottom is 1/16 by 134 by 3 m.; and the vertical plate is 1/16 by 3 by 334 in. The bars are all 3/16 by 134 by 5 13/16 in

First cut the parts with a hack saw, file the edges (rounding the top of the bars as shown), and smooth them with emery cloth, Apply a spot of solder on each of the two bottom plates. lay one on the other, and set them over a gas flame When they are fused together, cool them with a wet cloth, "Tin" the edges of the base and vertical prece and then hold them care fully in position with phers while soldering. Care must be taken that the first joint is not loosened

The three vertical pillars can be attached with solder or machine screws as desized. 11 solder is used, first thoroughly clean all parts, then tin the joining edges of the pulsars and apply flux to the bottom and vertical plates. Next place the parts and hold them over the gas flame, banding them with pliers and a wet cloth as shown in one of the accompanying photographs, If machine acrews are used, the holes in the pillars can be tapped to take the screws,

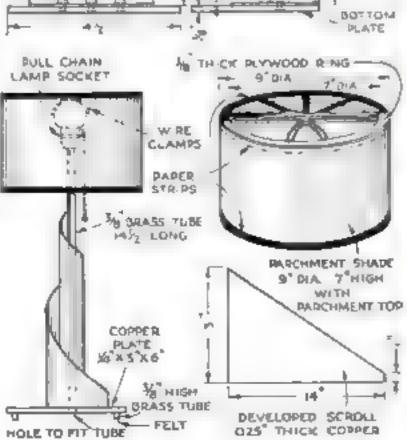
or the screws can be made to cut their own threads by forcing them into holes drilled slightly smaller than the outside diameter of the threads. Polish all surfaces with emery cloth, rubbing in one direction only.

The lamp may be either copper or brass. The center brass tube can be obtained at an electrical supply house with a thread

LVERTICAL PLAYES

BOTTOM

PLATE



By EVERETT EAMES

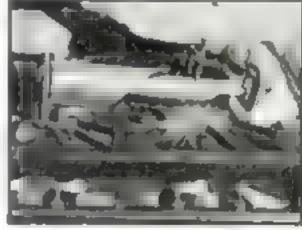
cut on one or both ends. First solder four small pieces of tubing to the base plate, then solder the tube into a drilled hole in the base, testing with a square to make sure that it is verical

The metal scroll is cut as shown from soit copper or brais sheet about .025 in thick, Roll it around a broom bandle and then unroll slightly to obtain the effect illustrated. The scroll should be soldered at the top to the center tube.

A pull-chain lamp socket should be screwed to the center tube, and a lamp cord passed through the tube. The short less should be filled with wood composition and have felt cushions glued on.

The shade is of special design to harmonize. It should be made of plain, mottled yellow parchment paper obtainable in stationery stores. Cut out the plywoodring and to it attach a built holder from an old shade. Tack the parchment to the ring and fasten the ends together with rivets made from small pieces of copper wire. Tack a disk of the paper to the top, and trim with strips of black paper.

The completed standard should be well polished and coated with clear lacquer



Small clamps hold the scroll to the central pipe of the lamp while the joint is soldered

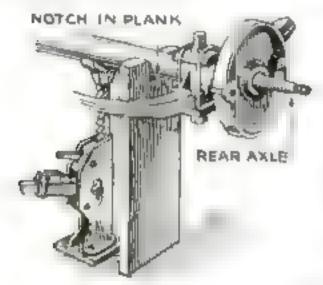


How the book end parts are beld to position over the fisms with piters and a damp cloth

Timely Hints for Car Mechanics

Locking Brace for Brake Pedal

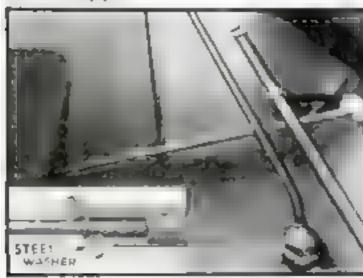
for repairs, a car can't ship off the jack if the simple auxiliary support adultarted below is placed beneath the axle. This support consists of a length of heavy plank or two by four notched at its upper end to receive the axle. The length of the support is determined by the distance from the ground to the axle when the wheel runs free



A beavy place of plank with a notch cut is the and makes a safety support when wheal is off

#### Brake Pedal Brace

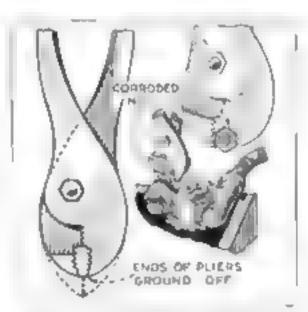
AN ADJUSTABLE, self-locking brace made from a piece of one-half-inchdiameter steel rod, a length of seveneighths-inch diameter steel pipe, and a hardened washer makes it a simple matter to hold the brake pedal in any desired position while adjustments are made to the brake rods or drums. A fourteen-meh rod and a twelve inch long pipe have been found suitable for the average car. In use, the brake pedal is pushed down and the square end of the pipe rested against the top of the pedal. The steel rod is then pulled out until its upper end rests against the base of the driver's seat and the washer is pressed against the angle at the end of the once



Salf-locking brace to hold brake pedal during adjustment is made of steel rod, pipe, and weather

#### Using Old Magnets

TWO discarded Ford magnets, supplied with ware pole extensions in the manner illustrated, form a valuable tool for retrieving small parts that drop into hard-to-get-at places around a motor. The magnetized extensions can be supped into small openings without difficulty. A better job can be had by binding the extensions to the magnets with copper wire and by supplying an iron keeper to be placed across extensions when the magnet is not in use



Grinding the ends of plier jaws to sharp to we permits net on consided cable clamp

#### Better Pliers

PLIERS used to adjust storage become corroded can be greatly improved by grinding the ends of the jaws to a sharp curve as shown above. Altered in this manner they can be forced down over the nuts with little difficulty and the teeth will get a good grip.

#### A Dunmer Guide

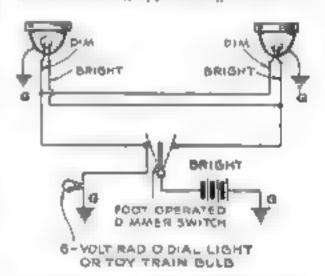
WHEN driving an automobile equipped with a foot-operated dimmer switch, it is often difficult especially when a car is approaching you, to determine whether the headights are bright or dim. A good plan is to place a small flash-

light bulb of the five-cet, type under the dashboard and connect it from the dimmer side of the circuit to the ground. When the switch is on the dimmer side, the lighted flashlight bulb will tell the driver at a glance that his headilights are dimmed and not blinding approaching drivers.

I wo ord magners it may be a lifet ed with est

sens to have been the man using an above

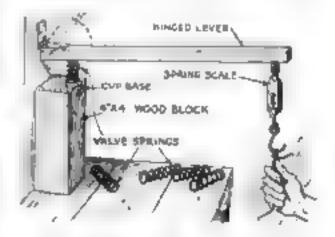
BEN WELL AFF AN E F T YE R



T ny hafb placed under the dashboard can be connected to show it highes are d m or bright

#### Testing Valve Springs

RELATIVE strength of valve springs can be determined by means of a simple compressing lever and a small spring balance. The lever is hinged to a wall above a stationary block. A small spring balance is attached to the outer end of the lever. To test a spring, place it on the stationary block, pull the lower end of the balance tittil the valve spring is compressed to almost its fullest amount and then note the scale reading. Any valve spring whose scale reading varies areatly from the average of the set should be discarded and replaced with a new one



Relative strength of valve springs can be ascertained with lever and balance as shown

What Use Can You Make of an Old Auto Engine

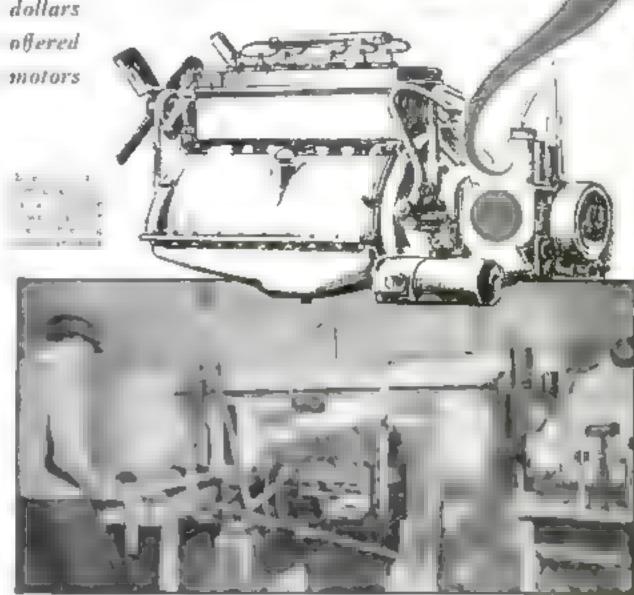
A first prize of twenty-five dollars and seven other cash awards offered for ways to utilize discarded motors

Charles City, Iowa, did not deprive Oscar Immer, an ingenious reader, from enjoying the conveniences of a modern motor-driven home workshop. An old automobile engine mounted as shown in the accompanying illustrations solved his problem for a total cost of \$10.

Can you think of other ingenious and practical ways to install and use a discarded auto engine in the home or shop, on a farm, or in a boat? Perhaps you have a definite idea and may even have gone as far as to draw up plans. To bring out practical suggestions along this line and make them available to other readers who may have similar problems, Portlan Science Monthly offers eight prizes for the best ideas on uses for discarded automobile or motorcycle engines. The prizes to be awarded are as follows

If you have a practical auggestion on this subject, sit down and sketch it out. Then write not more than 500 words describing the installation and tell how you would mount the motor in the most workmanlike and economical way. The drawing showing the arrangement need be nothing more than a simple pencil sketch so long as it shows clearly the application of the auto or motorcycle engine.

It is not even required that you actually are using a motor in the manner you describe. Of course, if you have already put your idea into practice, you may enter the contest, adding any improvements that have occurred to you. In this case it is suggested that you supplement your entry with a photograph of two.



The workshop of Oscar Immer of Charles City Inwa Lacking electric power he est up an old seto engine to drave his lathe, new, and other much nes, which he made himself

Entries in this contest should be mailed before November 1, 1932, to the Auto Engine Contest Editor, Popular Science Monthly, 381 Fourth Avenue, New York. N.Y. The judges of the contest will be the automobite and home workshop editors of Popular Science Monthly. Their decisions, which will be final, will be based on the ingemousness and practicability of the ideas entered. In the case of ties, each tying contestant will be awarded the price tied for. Only one idea may be submitted by each contestant. This contest is open to all except employees of Popular Science Monthly and their families.

You will see at once that the possibilities in this contest are almost unlimited in number, the use to which Mr Immer put

his old engine being only one of many, A study of this particular installation and use may, however, aid the reader in plan-

The automobile engine, which is from a model-T Ford, is mounted on two reenforced concrete supports so that the main shaft is at a convenient height for coupling in the main drive of the pulsey system. To lessen vibration, wood blocks were placed between the motor and the concrete supports.

The original housing, cut off just back of the rear hearing on the motor, acts as the front bearing for the puftry drive shaft. The other bearing is of the pillow block type supported by a wooden bracket which is fastened to the concrete wall with lag screws.

To lessen vibration in the system stall more, the wooden pulleys on the machines were assembled in such a ratio as to allow the engine to operate at its slowest practical speed and stall deliver the required speed at the machines.

A small pipe brings the gasoline by gravity feed from a tank hung on the outside wall. The exhaust is carried outside through a length of ordinary automobile exhaust pipe. Because of leaky pistons it was also found advisable to replace the breather cap on the crank case with a small pipe arranged to lead the crank case gases outdoors.

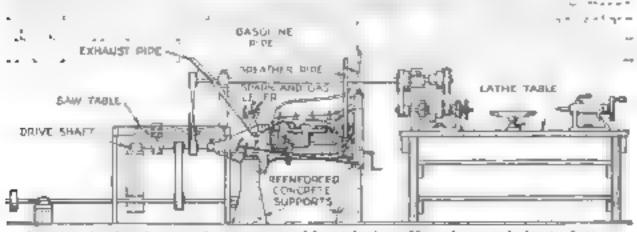


Diagram showing the general arrangement of humor's shop. If you have worked out a better solution for this problem or can suggest smether use for a motor, eater it in the contest

### JACK HAZZARD tells how to complete the framework of

The hayak is in it long, has a beam of 27% in and is 11 in deep amidab pa. It weight about 35 fb. ready to aunch, but will bold two men with light camping gear or one with full cruising equipment

Our Speedy New Canvas Covered KAYAK

1TH the growing popularity of the Estomo type of canoe, more and more requests have been received from readers for plans of an easily built, light, fast, and generally serviceable canvas covered kayak. How to act up the keel, stems, framet, and longerons of such a canon-one designed especially for POPULAR SCIENCE MONTHLY readers-was told last month (PSM., Sept. '32, p. 57).

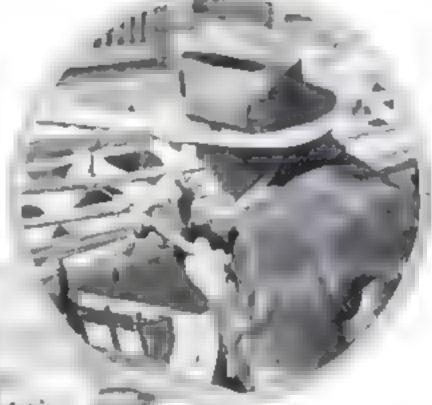
The next step is to fasten the walcs. These are let into the frames from 1/4 to M in. While cuts have been made for this when sawing out the frames, adjustments must be made as most of the joinings are on the stant. Tie the wases in position and make an improvised wooden gage block to aid in marking the frames. Saw the notches

with a back caw Tie or clamp the wales in position and theck for imperfections in the sheer A level laid across the frame is a good theck at each station, but it is hard to beat the eye, provided a sufficiently distant point can be had from which to

survey the job. The water are secured

The lengerous are tied in place or each station, then glued and lightly nation. Afterwards the sails are pulled out and screws driven

Refew The wale is fied on temporarily and the cuts tare which i to to by any thro marked with a wooden gage

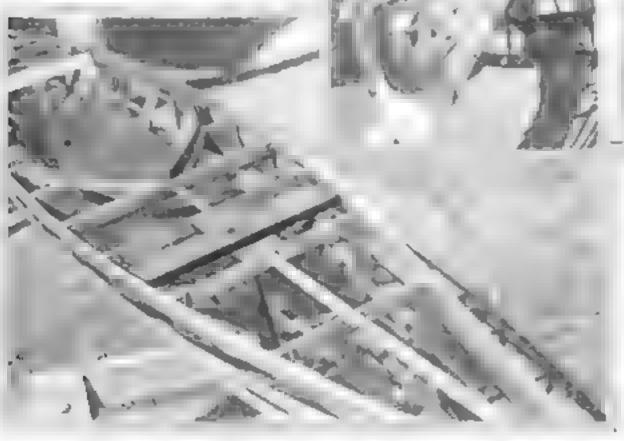


with 2-in, screws driven into the ends of the carlines and glued,

Because the water are larger than the langerous, more care must be exercised to keep them from splintering when bent, and it might be better to steam them. If this is decided upon, a large mner tube or a length of downspout pape makes an excellent substitute for a more formal steam box. A half kettle of water boiling hard will furnish enough steam for the job in about forty minutes. Stuff the end of the pipe opposite the kettle with old rags loosely to allow the escape of water caused by condensation.

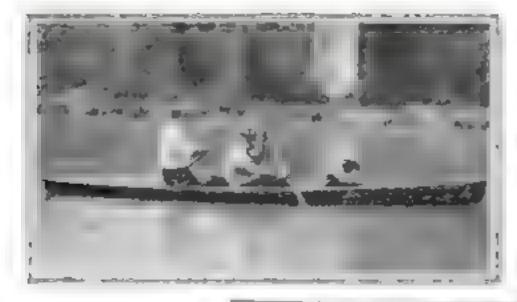
The outwales are cut from 3% by 44 in. spruce, the greater dimension being used in the vertical and the grain runrung through perpendicularly. The middle 4 ft. is left full size while the ends, each 6 it. long, are tapered from the bottom to within 1/2 in, of the top and from the outer face to within 1/2 in, of the back

Mark and cut the bottom taper on one end of one wale, then, using this end as a template, mark and taper an end of the matching wale. Use this second tapered end as a template by which to mark the untapered end of the first piece. Mark and taper the faces in the same manner, and work away the angles where the tapers run into the square portion of the wale. Run a line 15 in, below the upper corner.



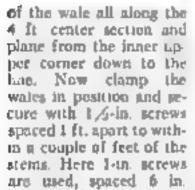
The framework from above. Note the most step and the cockpit cosming. The forward sudn of the coaming must be steamed before they are bent, and fitting them requires careful work

POPULAR SCIENCE MONTHLY



Hassard says weigh 155 ab. the other chap 163, and my son 70. a total of 290, and at dithere's freeboard' Below A theer p. 20 view of the frame enough to take the tube, and use a piastic wood composition to plug the hole caused by the pilot of the bit. Bore a 14-in. hole each side of the keel to let out any water which may get into the step and another in the side of the tube 1/4 in. from the bottom

At the level of the wate the tube passes through two pieces of 1/2 by 4 in. ash, one running fore-and-aft and one running athwartship. These are screwed and glued



It will be necessary to saw away the temporary carlines at stations 6, 7, 8, 9, and 10 to clear the way for the cockpit coamings, the forward ends of which must be steamed. At station 11 the side coaming atrips run straight back to the reenforced carline. A short piece of coaming in cut to fit anugly between them, and a triece of quarter-round oak is glued and

nailed in the corner

Rest the forward ends of the coaming on the wales and, clamping them in place at frames Nos. 9 and 10, work forward to 9, then 8 and 7, forcing them slightly downward to secure a gradual rise from 14 in, aft to about 11/2 in, at the forward peak, From frame No. 8 forward there is an inward bend and an outward twist impossible of attainment without ateaming.

Measure from laste the coaming perpendicularly above the afterface of the carline, borizontally to the center line. This measurement represents half the width of the stem block. Measuring from directly above the center of the cartine to the inside of the cosming at the stem gives the fore-and-after dimension of the block. and from the point where these two lines meet down to the upper face of the carhas represents the height at the afterside.

Square the end grain of a hardwood block and lay it off for making the atem block. Fasten this block to the end of the starboard coaming, fetch the port strip over to the center line, and mark the bevel as accurately as possible.

To hold the stem block down, make a metal fastening to fit the triangular inner face of the block and rest against the inner surface of carbne No. 5

Once the coamings are fitted, loosen a few acrews at a time, insert glue, and tarhten the screws permanently

The mast step is a 11/2-tn, brass tube mounted securely on a piece of 54 by 2 in. maple, which is screwed and gloed to the keel between frames No. 1 and 4 at a point 3 ft. 6 in. from the stem. Bore a hole half through the maple block just large

GAGE MARK SMALL BLOCKS ANA QUED ON CARLINE GAGE MARK A PARALLEL MARK SHUWS

A samply made wooden gage block is used to and in marking the notches for the invales

THE BEVEL TO BE CUT

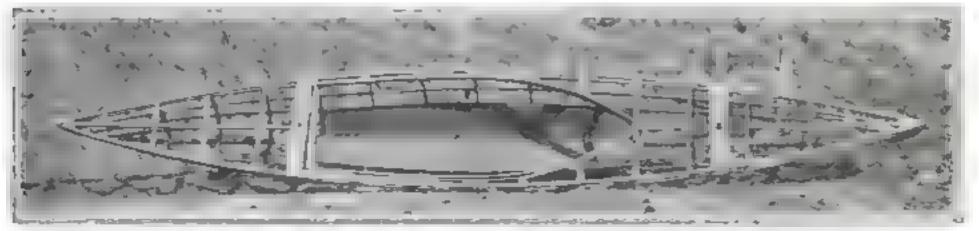
together and screwed to the wares. To distribute the strain and to provide a beam upon which to tack the decking, pieces of 34 by 36 in spruce are fitted, glued, and nailed between the frames along the center line from the apex of the cockpit to the

stem bead

To provide a suitable ledge upon which to tack the deck, it is necessary to fit pieces of spruce between the frames and rightly against the outside of the coaming at the level of the wales. Apply glue and nail these pieces to the carlines, and runscrews from inside the cockpit,

Frames that show inside the cockpit are sanded smooth, and the cockpit coamings are cleaned and sanded. The 3/16-in. plywood floor boards, which are fitted tightly just over the keel, are screwed in place, A. the ends the boards will be about 6 in in width, but they widen at the middle to almost 10 in. Give the whole frame two costs of spar varmals, preferably of the slow drying type. Rub down between coats only those parts which will be in sightcoamings, inside and out; upper inde of floor boards, upper portsons of frames Nos. 5, 6, 7, 8, 9, 10, and 11, and floor boards to wale. Make doubly gure to varrash the edges of a copywhold frames, tarring the canoe over after each coat to touch up places inevitably missed. A quart of varrush will be sufficient

Next month instructions will be given for covering and foushing the kayak.



The completed framework ready far the cauvas covering. The deck stringers, cockpit coaming, and floor boards can be seen. us well as the two mast steps. The after step, bowever, was added for experimental purposes and is not needed for ordinary use

# Log Cabin Recreation Room

Y 1 SING log siding—boards rounded on one inde to look like pine logs stripped of bark-any home owner can transform a part of his basement or attic into what appears to be the cozy interior of a log cabin. Ship-lapped joints along the edges of each strip of siding make it extremely easy to apply

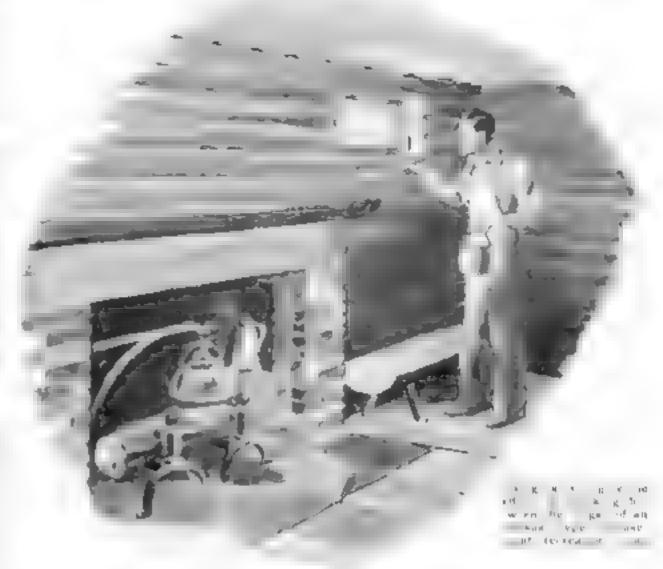
An unfinished attic is well adapted for log siding, since the wall study supply the right sort of backing. If the siding is to be appried to a concrete basement wall, it will be necessary, of course, to erect fur-

Being available in several widths, the log strong gives a most realistic effect. At the corners of the room the siding can be mitered, or alternate strips may be allowed to jut through to give the interlocked effect of the logs in a real cabin, Stripes of grayth-white wall paint applied to the foints between the 'logs" will smitate the chinking. Log siding can also be used in

bunding up the doors.

In planning a basement or attir recreation room, try to make use of existing conditions as far as possible to carry out the cabin design. Attractive casement such can be substituted for the usual attic windows; and if the recreation room is to be in the basement, leaded glass sash of simple design can be substituted for the ordinary unattractive celtar sash. Should an extra window or two be needed for the sake of appearance and it is not desired to cut in real ones, finitation windows can be placed where necessary, Booksheives and a fireplace—the latter either imitation (see P. S. M., Dec. '31, p. 98) or real-will aid to the effect. If the use of a genuine freplace is possible, a wood box can be built into the adjoining wall space in imitation of a quaint Dutch oven

When purchased, log siding is the nat-



ural pine color, but several costs of salver gray oil stam will give it a pleasing aged appearance. If desired, a mistic finish can be obtained by using dark brown stain.

Your log cabin recreation room can be made a complete unit in itself by planning ample closet space for the storage of games and bridge tables and fitting up a small buffet closet with an electric grill for preparing midnight suppers.-G, W

#### OCTOBER Shipshape Home SUGGESTIONS

Clean out chimney and amoke pipe Flush steam boiler and water tank

Insulate steam gipes

Cleso water gage on furnace

Check radiator valves

Clean basement

Repair broken or cracked windows

#### Special Flushing Strips Stop Leaks in Roof

BY CUTTING and folding sheet copper in the fashion shown below, it is a simple matter to insert new flashing in leaky closed valleys on a shingled roof. The point of the folded flashing piece can easily be shipped under the shingles and

pushed into place, the triangular shape making it possible to avoid striking the shingle nails. The size of the sheets to be used depends on the pitch of the roof and the exposed area of the shangles, Start placing the flashing at the bottom row of

shingles and work up toward the top of the vallight and the roof is otherwise in good condi- A PORTABLE election, no nails will be required to hold the flashing in place.-G. C. B.

How the dashton entree and rut. folded to suit the augur of the valley. and pushed up under the rows of shingles so that one over-

tape the other

## ley. If the shingles are Drilling Open a Drain

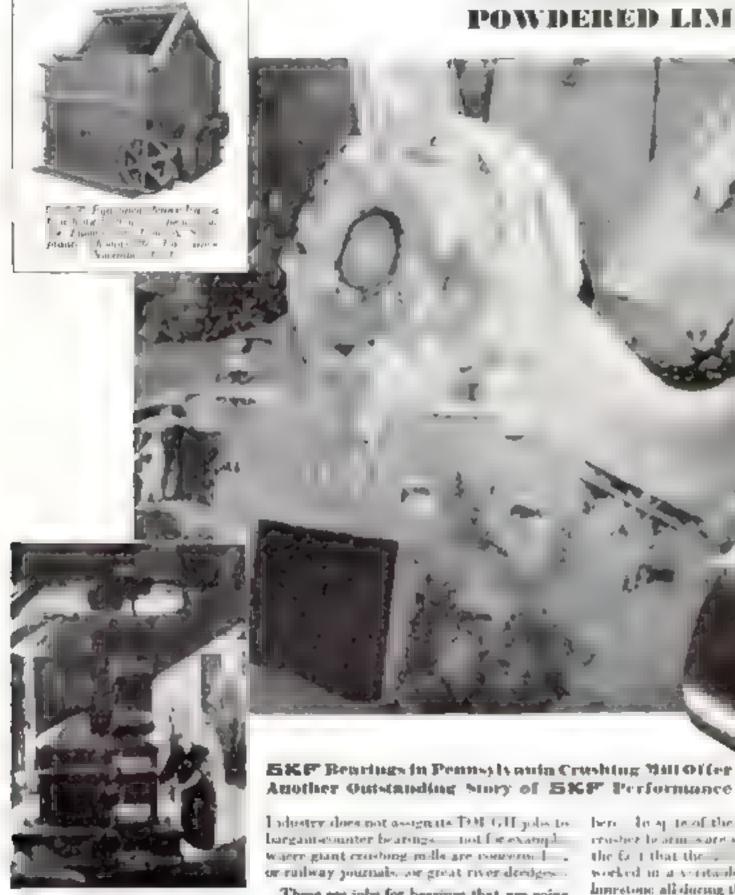
Anc drill and a 3 or 4 ft. length of stiff wire cable can be used for cleaning clogged floor or laundry drains Ravel about 2 m. of the cable at one end and clamp the other end firmly in the drill chuck. The frayed end will drill through obstructions that will not otherwise yield -C P



POPULAR SCIENCE MONTHLY OCT 432.

# ...ELEVEN YEARS of SERVICE

in a BLIZZARD of POWDERED LIMESTONE!!



MIST Piles Block as them in stajes illustration provide a perfect hundred for illustration on the free free oil in and diet and other feerige matter out.

Industry does not assign its TON GIT poles to bargamacounter bearings that for example water grant crosbing mile are reserved | .. or rudway journals, or great river deedges .

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And so, eleven years ago, almost as a matter of standard practice, 23 F Bearings went into the Pennsylvania Crusher shown

ben lost tenf the saming or letterle b proster bearing ware very all discount of the fall that the . Bearings on the pubworked in a veritable blozzard of powerel Impretone all during that perced, the bearings are still in service ... still in perfect condition.

ECSO" Bearings are built to out-perform on the toughest kind of john, the brute jobs of industry ... so they provide a MARGIN of performance on almost any kind of task to which they are assigned. 2005 P Industries, Inc., 40 East 34th Street, New York, N. Y.



2013

PROMISE ... PERFORMANCE

# Getting a Good Start in Home Movies

By Frederick D. Ryder, Jr.

HERE are more ins and outs to this home movie game than I anticipated," an amateur photographer told me the other day. "The wife," he went on, "has been pestering me to take movies of the children, and I've agreed to get an outfit. I thought all I had to do was to go buy it. Now I discover there are two kinds of film and so many different kinds of cameras and projectors I m in a daze. I always thought taking movies was just taking little pictures in wholesale lots, and there shouldn't be anything complicated about that. What kind of an outfit should I buy, and why?"

If you, like this man, are thinking of breaking into the anniture movie game, you ought to get clear in your head the essential differences between the still photography you have been doing and the motion picture photography you want to take up. Of course they're alike in a lot of ways, and what you know about still photography will belp you with the other game. But there are important differences in the technique and in what you

can and cannot do.

Motion picture photography is, after all, just what its name implies, the photography of motion. A picture of a house or a distant view is no better in the movles than it is in a still pocture. On the other hand, a stall picture of a child playing may be interesting in a way, but nevertheless it can only be a frozen impression of some fleeting glimpse of the youngster. The movie camera actually records the whole motion with all the cute tricks the kid does with its face, its hands, and its feet. The movie film, in other words, records life, while the still camera only freezes a momentary view of any subject into perpetual immobility.

A lack of understanding of this essential difference probably explains why many movie beginners get uninteresting results out of their first few reels of film. Planting lattle Wilhe in front of the camera and letting yards of film grind through the mechanism while Wilhe gapes into the lens will not produce a film that will hold your friends' attention.

Keep in mind that the motion picture camera is designed to record life and movement and encourage the children or any



Indoor movies at night-even in full culor-are sensity takes. Photo-food babbs in your own floor lamps supply ample folumination. Fewer babbs are needed if special reflectors are used

other human subject to engage in some normal occupation that includes action while you do the shooting.

Another movie mistake that the experienced still photographer is just as likely to make as is the rank beginner consists in making the shots too short. When you press the button to start the mechanism, keep it running for at least ten seconds. A flickering glimpse that terminates before the audience gets a really good look is most annoying.

A third beginner's trick is to wobble the camera or swing it too rapidly. The first causes the picture to jump all over the screen, and the second makes one

dizzy to watch.

These are, of course, just samples of the differences in movie technic as compared with still camera photography. As far as the mechanical possibilities are concerned, two vital differences stand out

birst, there is no such thing as doing your own hisshing in amateur motion picture photography. You just press the button and leave it to the manufacturer to process the film. This is of interest only to the relatively few more advanced amateur photographers whose chief interest in the subject lies in the work of developing, printing, and enlarging—in other words the chemistry of photography. Amateur movie making will have little appeal for such a man.

Of far more general interest is the fact that amateur motion picture photography offers the only practical and surple way to take pictures of things in full and completely natural color. Recent developments have made this feature of the amateur movie game of still greater importance. Now, with the aid of the new super sensitive color film, you can take full color pictures on slightly cloudy days instead of having to wait for blazing sunlight, as was formerly necessary. Furthermore, the new film is so extremely sensitive that full color movies can be taken indoors at night with the aid of several photo-flood bulbs costing only thirty-five cents each!

the aid of several photo-flood bulbs costing only thirty-five cents each!

The first question for you to decide as a prospective smateur movie photographer is the matter of size. There is the regular sexteen-militarier film and the new

You will decide on the split-sixteen him if cost of operation is of paramount importance, because this size him gives four minutes of projection time at a cost of two delians and a quarter compared with six delians for the same amount of screen projection with the regular sixteen-millimeter film, or nine delians if you wish your pictures to be in full color.

split-saxteen (P. S. M., Sept. '32, p. 27).

Within its projection size limits, the split-sixteen gives virtually as good results as the regular sixteen, assuming cameras and projectors of equivalent grade. But the regular sixteen-millimeter

### Photo Contest AWARDS

FOR the best photograph submitted in our June Photo Contest (P. S. M., June '32, p. 101), J. L. Sandy, of Chicago, Ill., has been awarded the \$10 prate. The following won honorable mention in the same contest: George W. Agan, Jr., Herkinser, N. Y., Joseph Buldoff, Cincinnett, Ohio; Roy E. Bedbury, Senttle, Wash., G. Clane, Detroit, Vich.; Wiftin Fisner, Tulsa, Okla., George Griffis, Butler, Pa.; Pleaner Harris, Haenmond, Ind.; Don McCavick, Cedar Falls, Iown, Lee McCavick, Catalan, Calif., C. O. Mock, Levington, Ky.; Proscott H. Perros, Providence, R. L.; T. Schnyler Robbins, Trenton, N. J.; H. W. Schoepplet, Ratherford, N. J.; J. M. Stofan, Gorfield, N. J. The July contest winner wiff be unanonced next month.



• It's an exact is make clear, builtient home morals with this complete of home many comercial dim . . . prove a letter . . and that's all. It's as easy as making suspends.

# The Wonderful Story of Growing Up



## Your Movies of it will be your Family's most precious Possession

HOW priceless the living movie record of your baby's smile ... the first uncertain steps ... paying in the sand ... the drama of going to school ... sports ... picnics ... the first party dress or first long trousers ... milestones on the road of growing up.

Such movies are so easy to make with Ciné-Kodak. And they are vivid with the reality of lifelike action. A record of your child that time cannot dim—a priceless possession in years to come. And not expensive either,

Ciné-Kodak is as easy to use as a

Brownie. Aim . . . press a lever . . . that's all there is to it. Make perfect movies the first time you try. We do the rest, finish the film and return it ready for your Kodascope projector

Your dealer will gladly show you typical Cinékodak movies. Stop in and see him. Eastman Kodak Company, Rochester, New York.

# Ciné-Kodak

Simplest of Home Movie Cameras



This versionle, allpurpose camera permus quick change of
lengs and can be
fitted for Kodurator
(masses in for color).
Loads with full 100
feet of 16 mm, film.

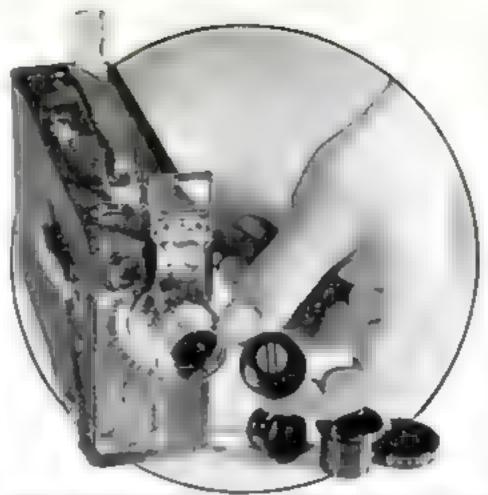
You Pay No Tax... The government has place—ten percent tax on cameras and on other articles that you use in your lessure hours. But as all outdoors invites your Cinc Kozak, this company will not set anything interfere with that invitation. It will also the tax. No increase in the price you pay for any Eastman camera.

firm makes possible much larger and brighter pictures and also pictures in full color, an impossibility with the splitsixteen

If you have done much still photography, you are quite likely to make the common mistake of considering the camera more important than the projector. As a matter of fact, the quality of the projector is more important because you use it more often. There is no sense in spending nearly all your money on an extra fine movie camera and then have to skimp on the projector and end up with poor pictures on the screen.

Remember that you are almost sure to become interested in commercially produced axteen-millimeter film subjects, and the success of home untertainment with these films depends on the quality of the projector

Now about the prices of equipment, You can get either



Firting a three-color screws to the only change required for solar morses

a movie camera or a movie projector for the regular sixteen-millimeter film at almost any price from about thirtyfive dollars up to several hundred dollars. If you wish to go in for full color photography later on, then you must have a camera with an F/19 anastigmat lens made to fit the special color filter used in exposing the color film. Such camera will cost you shout one hundred and fifty dollars or more. The same applies to projectors. If you want to project full color movies, you must have an outfit made to take the special color projec-Lon screen that fits over the projection lens. Such a projector calls for an outlay of one hundred and fifty dollars of more

At present there is only one movie camera and two sizes of projectors made for the split-sixteen film. The camera and the smaller projector total a bit over fifty dollars.

### Real Plants Thrive in This Tiny Toy Greenbouse

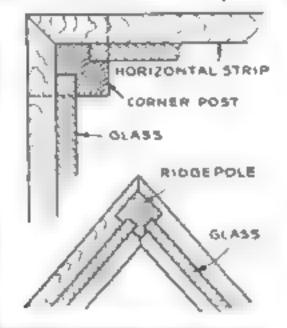


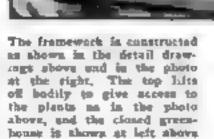
Arrivot did intended as a toy, this me ature greenhouse, which is built from crap material, will prove interesting to grown-ups as well as children. It can hold a dozen or more tiny pots with growing plants, or two or three larger ones.

The greenhouse illustrated was made from store-box lumber and a number of old 4 by 5 in photographic plates cleaned with hot water and an old tazor blade Of course, you can use acraps of window glass cut to size just as well

The most suitable wood to use is cypress because it resists moisture, but almost any wood will do The base is 1 by 7% by 13 in. A moided edge was cut to improve its appearance Overall dimensions of the house exclusive of base are width, 5% in.; length, 11 in.; height, measured to apex of roof, 7% in.

After shaping the base, cut corner

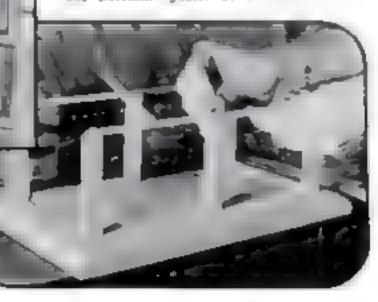




parces and other uprights as needed, and fasten them to the base with nais and glue. Space them so that the glass pieces will slide into ½ in, deep grooves. Run 3/16 by 3/16 in, strips around the base between the uprights to seal the lower edges of the glass. Connect the top ends of the uprights with similar strips, placed at one side so that the glass can be slipped into the grooves or removed

The roof is separate, serving the purpose of a removable cover. In constructing it, first make a rectangular frame of 14 by 15 in material so that it will coincide with the top edge of the house proper. Then construct triangular ends, the dimensions of which will depend on the width of the glass side panels used. The cidge piece is square in cross section and grouved on two adjacent surfaces. Spacers for separating the glass panels are grouved on the edges and measure about 3/16 in.

Fasten the wood frame together with casein glue and small bails or common pins used as nails. It is best to paint or lacquer all wood parts possible before assembling. The tiny earthenware pole can be obtained at almost any florists. It desired, a metal tray can be placed on the bottoms.—John C. Workley



POPULAR SCIENCE MONTHLY

#### AUXILIARY BENCH AIDS THE MODEL MAKER

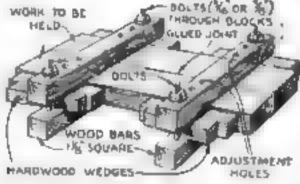
MY BENCH being pretty well taken up with lathe, emery wheel, saw, and other tools, I had to resort to what I call

an auxiliary beach to gain working space. This is especially convenient for model making. It may be



prace of any stock about the shop mine is a piece of 3, sh pine 8 in wide and 24 in long Across one end a piece of 3, in hardwood, 2 in, wide is screwed to serve as stop for planing. On the other end a V noich 3 in, wide and 4 in, long is cut to allow a coping saw or fret saw to be used. A block about 1½ by 2½ by 12 in, is acrewed underneath and in the middle of the large piece to allow the auxiliary bench to be clamped in the vise at a comfortable height—G. T. Hothers,

# HOMEMADE CLAMPS FOR GLUING WIDE BOARDS



Improved her comps which not only exert presents edgewise but also he d work flat

With two or more boards have to be glass together to turn a wide piece, it often happens that there are no cabinetmaker's bar clamps at hand, or too few clamps for the number of joints which have to be made at one time. The accompanying drawing shows a homemade clamp that is inexpensive and efficient The dimensions given are satisfactory for bars up to 2 ft. in length, for longer clamps, both the bars and the boils should be heavier. The bults must be large enough to resist bending, and the wedges and brocks should always be slightly thinner than the material to be clamped. In use, the clamps should be slipped over the work, and the nuts drawn moderately Light; then the wedges should be driven in firmly.-HARRY N ROWLAND.

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#### INEXPENSIVE

# Dividing Fixture



sible operations in the home machine ship become compartionly of easy when a small dividing facture one that thus rated is available for use on the lathe, militing machine, or thaper. It can be used for spacing the faces and tenters and tenters for cutting teeth and heagonal cause and also for making go as with a dy cutter.

The device was constructed by B. L. Kemper, a druggest of Perham. Mino., who has for many years made a bobby of his borse machine shop. He makes many of his own tools and has built much of his examinent including both a milling machine and a shaper

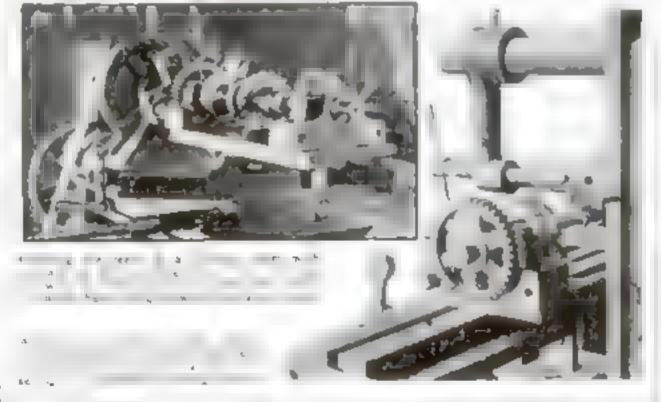
For A among the divisions for this indexing head. Mr. Kemper makes as rothe screw cutting gears of his lathe. They give him every division from 2 to 15 then every even number up to 52, and also 56, 40, 44, 48, and 52, which is a sufficient variety for a most any amoteur work.

The accompanying photographs. Me Kemper writes, will explain the device well ephoch is the content one of ata of depend upon the mach it is available. The hase consists of bree astings the base plate and the two supports for the centers. The tase place of course as well be made from a piece of or -rolled stee a sup-

eliminate the facing operations necessary of a ron The two center supports are task from the one pattern, and the fatter was removal of the work. Both supports are sawed through on one side so that a clamping screw will hold the centers besolutely tight. The centers, which are made rather heavy will stand quote a fool thrust without springing. The center supports can be removed from the base and fastenes, directly to the table of my matter.

#### COLORING BRASS BLACK

A stack finish for brass can be obtained by a simple chemical process. Make a strong solution of intrate of silver in one container and of attrate of copper in in their Maxtie two sout ops together and the brass at a 1. Now heat the brass events and the brass events are to be presented brack.



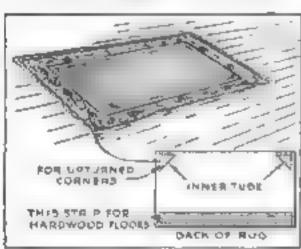
#### SHEET OF PAPER REMOVES DUST FROM AQUARIUM



When the sheet of newspaper is colled back from the water, it corries the dust with it

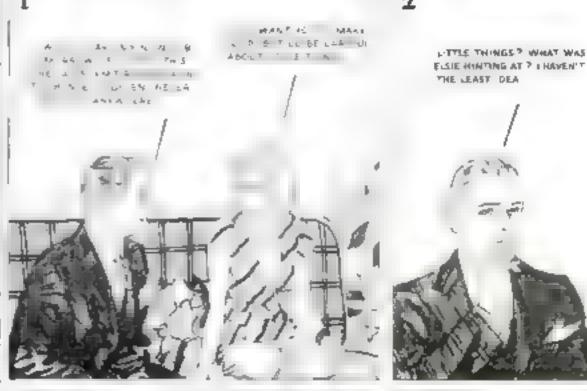
EVEN though an aquarium is covered with glass, a certain amount of dust will invariably accumulate on the surface of the water. The dust impairs the natural beauty of the aquarium and is detrimental to the fishes. To remove it quickly and easily, cut several sheets of newspaper approximately the size of the water surface and spread one of the sheets on the water. Let the paper remain until it begins to soak up the water—usually two or three seconds. Then take hold of one end of the sheet and remove it by lifting it upward and rolling it back. The dust will cling to the paper.—John Edwin Hoos.

#### OLD INNER TUBE STOPS RUGS FROM SLIDING

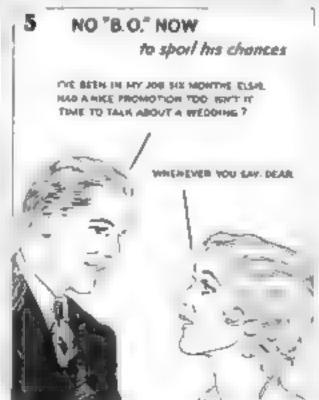


TRIPPING over a small rug which has upturned corners or falling because a rug slips on a polished hardward floor is a common household accident. It is easy to prevent such accidents, however, by applying commercial preparations to the back of the rug to prevent their slipping or curling up at the corners. Upturned corners also can be cured by sewing a small triangular piece of old automobile toner tube in each corner as shown; and a good way to prevent slipping is to sew a strip about 5 in, wide along the edges on the back of the rug Have the inside of the inner tube facing outward so that it will be in contact with the floor A rug so treated will not slide even when a vacuum cleaner is used .-- JOHN DE VINK,

# THE MAN WHO COULDN'T KEEP A JOB \_\_ by Timmins







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Furniture	
Bookehelf and Book Ends. Modernistic, 100	.25
Bookshalves, Hanging, 27	25
Bookstand, Modernistic, #4	23
Book Trough, 45	23
Cedar Chest Mebugany Trimmed, 17	25
Chair Rush Bottom, 36 Chests, Tressure 78	23
Cock Grandfather 29	23
Desk Colonia 21	23
End Table, Magnetor 48	2.4
Fireside Bench, Calonial, 187A 188A	So
Ritchen Cabinet, 5	23
Lames, Modern stre 17	25
M reor Scroli Frame, 101	23
Muffin Stand. Polding. 273A 274A	7.5
(See page 90 for his of material)	
Pier Caumet and Corner Shriven, 77	13
Radio Cabinet. Console. 70 71 Screens. Modern at . Polding, 52.	25
Sew ng Cabinets, Two, 31	25
Sewing Table. J.	23
Shelves and Lamp. Moderniatic #J	.25
Smoking Cabinet. 2 Stand. Low Modernistic 100.	25
Table. Gate Leg. 24	25
Table, Tavero, 105	.25
Table. Tely Top Oak , Top 29 by 24 m ) 140	
Tea Wagon, II	25
Telanhama Takta and Camb 40	
Telephone Table and Stool, 18	25

Raulto Setz

Amplifier, Three-Stage, Andre-Frequency, 63

Pive Tube (Bartery Operated 56-35, Four-Tube (Bartery Operated), 43,

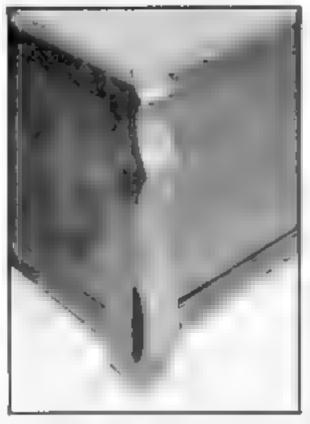
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Mistellaneous	
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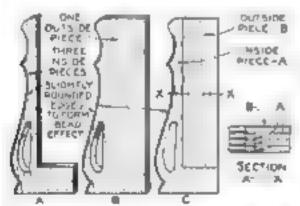
25

Bereen Grad Set, 299 ...



A aubstantial chant log built up from four places ', in thick to give a molded effect

AMATEUR woodworkers usually avoid any attempt at molding long, ornamiental heads, reeds, or flutes on furniture parts unless they have a special plane or a routing machine suitable for the work In many cases, however, a beaded effect can be obtained by building up the parts from several thin pieces. The chest leg illustrated for example, was made of four pieces of 1/2 in thick material sawed to shape, three being inside pieces as shown at A in the drawing and one an outside piece like B. The pieces were lightly nailed together and the edges trued up and made exactly abke with a wood rasp and sandpaper. Then they were separated and the



The leg is made by cutting three places like A and one like B and assembling thom as at C

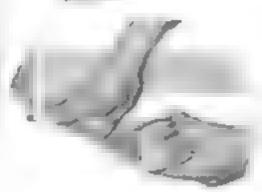
front edges rounded to gave a beaded effect, as shown at C

When finally glued and bradded together, these legs had the additional advantage of providing a strong support for the boltom of the chest and an unusually rigid comer construction. With a little ingenuity this method may be adapted to many purposes.—CLINTON F. BLAKE.

Eveny owner of a small power shop is likely to have trouble with slipping belts, I have tried various commercial belt dressings, but have found nothing better than a stiff paste of powdered rosin in castor oil. It keeps the beits soft and pnable and makes them pull well.-B. L.

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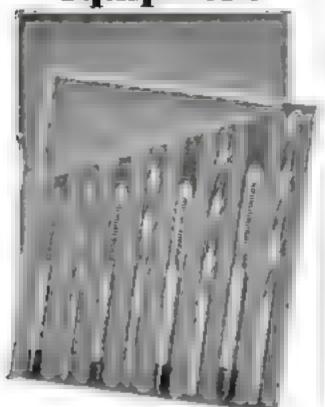
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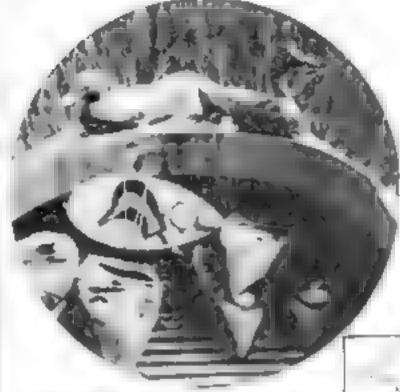
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#### DECOY DUCK HEADS PACK INTO BODIES

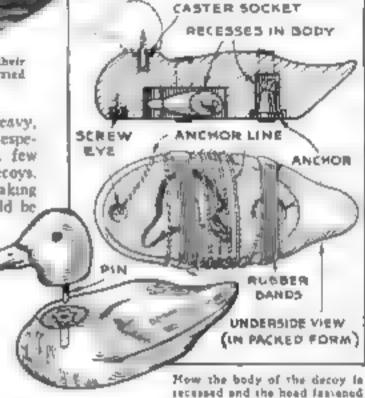


With heads and anchors packed inside their bodies, the decoys can be more passly carried

WHEN bunting ducks, one has a heavy, bulky load to pack to the blands, especially if many decoys are used. A few beads became loose on the writer's decoys, and this suggested the idea of making each head detachable so that it could be packed with the anchor in the body of the decoy.

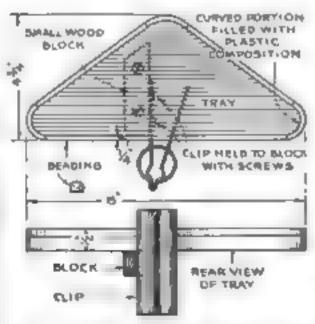
A brass per was threaded into the bead in place of the dowel, and a caster socket fastened in the body. A hole slightly larger than the profile of the head and 135 in, deep was centrally located in the underode of the decoy Behind this a second hole was bored with an expansive

but to hold the anchor At the forward end of the decoy, centrally located on the undersue, a third hole was bored to contain the brass screw eye for fastening the line to the anchor Small buttons of lead were added as necessary to balance the decoys. A 34 in. wide rubber band cut from an old inner tube keeps the anchor in place, and the anchor line is wrapped around the body to prevent the head from falling out. To make atill more sure that the bead will not slip out, another rubber band like that used for the anchor may be applied,-ANTHONY VAN KAMMEN

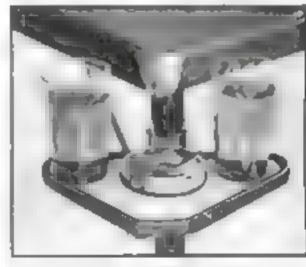


#### TRAY CLAMPS ON LEG OF CARD TABLE

A NEAT little tray that holds two glasses and an ash receiver safely below the surface of a card table can be made from a piece of 1/2-in, pine cut in a triangular shape with rounded corners, as shown A strip of wood beading abould be glued along each of the straight edges, and the



The tray consists of a triangular piece of M-in, wood with a big spring thip attached



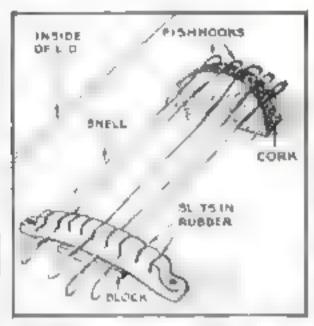
Small us it is, the removable they has coom for two glasses and an ordinary eah receiver

rounded corners filled in with a plastic wood composition, which is later shaped with a file to match the beading. A large size spring clamp, obtainable at a stationary store, is attached to a block underneath. It will hold the tray firmly on either round or square table legs.

A piece of felt or blotting paper is placed in the bottom of the tray to absorb tiquids. A pair of these trays will help keep the top clear for playing.—E. E.

#### STORING SNELL HOOKS IN A TACKLE BOX

SNELL hooks can be stored in perfect order inside the hid of your fishing tackle box by means of the simple arrangement illustrated. Half of a large, flat cork about 2 .m. in diameter is first nailed in an upright position to the inside of lid This is for the points of the hooks. The snells are kept in place with a fastening

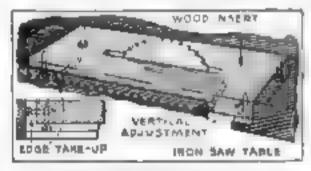


The fishhook points are set into the tork, and the eners are E-pper into the arts

which resembles a violin bridge to some extent, but is cut from soft rubber (a piece of an old eraser will do). This is 2 in long and about 4s in sociare and has deep slits cut across its upper edge. It is attached to the lid with nails and is blocked up in tenier so slata remain open.

To place a hook, push the point into the cork and pull the shell taut, inserting it in a six directly opposite the book briefly carno get tangled t properly arranged and they will dry straight,-P. B. PRICE.

#### ADJUSTABLE INSERT FOR SMALL SAW TABLE

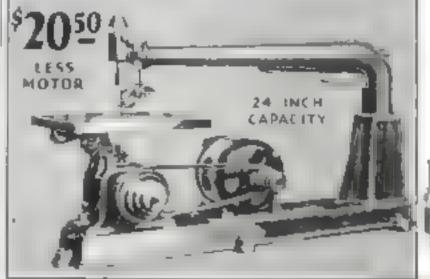


Ste oval-headed screws placed an above make it possible to ad ust the insert accurately

"HE wood maert in the center of the Fron table of a small circular saw will shrink in winter and swell in summer represents the inschine is in a basement shop that is relative vidamp at times Sometimes it may have to be hammered out, at other times it will be loose and not quite flush with the top of the table. Such an insert, however, can be kept anur Take it out when it is tight and rip 1/2 in from one side; then drive two 1/2-in. No 4 oval-headed screws in the cut edge about 1 in, from the ends. These screws can be adjusted in and out as necessary. Similar y, about 1/16 in, can be planted off the bottom and four screws used for the vertical adjustment.-C. W. OLSON

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#### TUNNEL GOLF-A NEW BLIND-TRAP GAME



Lime for fall and winter entertainment. To make it, three 10-in, disks of three-ply veneer are used, with a steel ball bearing to serve as the "golf" ball

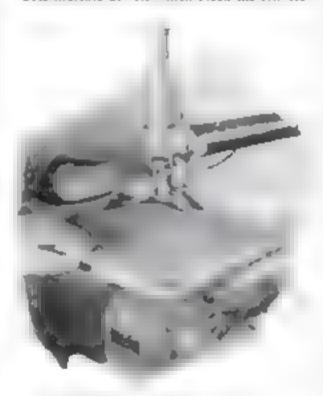
Place one of the disks on the scroll saw and cut it up into a spiral strip about 34 in. wide, as illustrated. Cut this up into various lengths and glue part of it to enother disk to make a "magic mase" with channels or tunnels through which the ball bearing can roll easily. The passages, however, must be obstructed in places with "trape" as shown; these stops are merely short pieces of dowelsing glued firmly. Part of the remaining spiral strips are then affixed to the remaining disk in such a way that they will mesh or interlock properly when the disks are placed together

A hole is made for entrance of the ball bearing near the center of one disk, and a gap or opening in the outermost spiral strip provides an exit at the edge. The prepared disks are then fastened together with a central bolt

The player holds the round game board thus made and drops the bearing into the hole near the center. From there on the "golfing" is "blind" and must be completed by a sense of balance and feeling if the ball can be maneuvered so as to miss the traps, it will make an exit at the side. When a player becomes accustomed



The mace as made by the author. The black dots and cate downle which block the tunnels

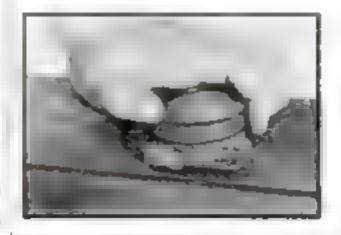


Cutting the spiral strip on a secoli naw

to the arrangement, revolve the top disk sufficiently to change the relation of the "traps." Prizes can be given for winning in the shortest time.—KENNETH MURKAY

#### WOODEN CASTER WELL HOLDS STEEL WOOL

A wooden caster well of the type illustrated at the left makes an unusually good holder for steel wool, especially when polishing metal or when a coarse grade of steel wool is being used. Larger areas of the wool are presented to the work than when the steel fibers are held in the fingers, and steel splinters cannot enter the skin,—R. W



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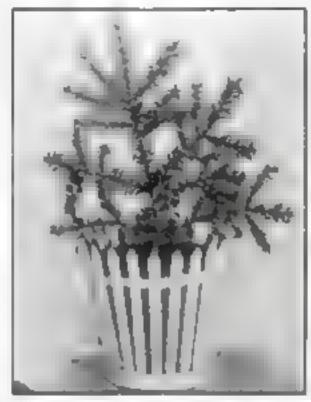
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#### SMALL PICKET FENCE HIDES FLOWERPOT

A MINIATURE picket fence to cover and partly conceal an unsightly clay flowerpot can be made as shown from about twenty-four pieces of 55-in half round wood moliting or beading, each approximately 6 in long

Whi i e one end or each piece to a point and sandpaper it thoroughly. Cur a 1/2 in



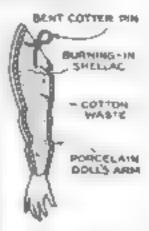
Mustly painted pickets held at the top by a subber hand form this novel flowarpet holder

wide rubber band from an old inner tube and fasien, he strips to a with a moracks. spaces should be left between the strips as they will spread apart when the band is stretched over the flowerpot. The circular cover of an old can may be used

It is best to paint the pickets, rubber rail, and base some bright color before purting the parts together. Then slip the assembled fence over the flowerpot from the bottom and tuck the lower ends of the pickets inside the rim of the can cover which forms the base.-E. T.

#### REPLACING EYELETS IN A PORCELAIN DOLL

WHEN an eyelet breaks out of one of the porcelam arms or legs of a doll, fill the hollow part of the arm or leg with soft rotton waste to within 1/2 or 3/2 in. of the top and then insert a cotter pan through the hole, as illustrated. Melt a small amount of stick shellar of the kind used in conceaing blemishes in furni ture and pour it



Cross section view of a repaired arm

pround the cotter pm until the opening is full, or use sealing wax, rosin, or the composition with which dry cells are scaled. The cotter pin should be set perpendicular to the joint surface of the arm or leg.-GLENN W HARDING.



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#### EXPERIMENTS WITH GAS FOR HOME LABORATORY

(Continued from page 54)

solubility. It is by this means that salt is extracted from mea water. Large ponds of sea water are allowed to evaporate and as the solution becomes more and more concentrated the salt crystallizes out while the more soluble substances remain behind

Some chemicals exhibit curious colur changes when made into solution. Copper bromide crystals shaken with a very small amount of water produce a reddash brown liquid. Adding a very small amount of water makes a green solution. If still further dduted,

the liquid will become blue.

Cobalt chloride or cobalt mitrate dissolved in water and applied to a white cloth will color the cloth brue or red, depending on the amount of moisture present in the surrounding atmosphere. The little "weather forecasters" in the form of flowers or dresses on cardboard figures are made of cobalt-chloride treated cloth. When there is little moisture in the air, the crystals of coladt on the cloth remain blue. When the humsdity increases, the cloth becomes red ar pink, You will have no trouble in making these moisture indicators in your home laboratory from cloth and cobalt chloride

#### SANDING SHARP CURVES ON POWER JIG SAW

THOSE who have used disk and drum labor they save will appreciate a method for sanding small, sharp curves and inside cuts that cannot be reached by these tools The idea is samply to utilize the power scroll saw or jig saw for this work by making sanding blades of various sizes and degrees of flaction. This is done by gluing sandpaper to a metal backing. The metal may be any old scrap, or a piece may be cut from a tin can. The metal blank in made the same length as a fret saw blade; and if from an old can, the outside of the un should be coated with shellar to make the glue take

Both sides of this blank are coated with glue. A piece of samipaper of cloth of the desired grade is then placed against the glurand the whole set between two hardwood blocks and clamped in the vise overnight Then strips are cut from the blank with the tio stups, varying in width from 1/2 to 1/4 to These strips, which must have both ends cut to enter the slot provided for the fret saw blade, are med as required.

As the blades are so easily and cheaply made, a good supply of various grades may be kept on band. Ordinary sandpaper may be used, but the cloth wears longer. Emery cloth, however, in not sustable for use on

wood.-H. CALDWELL.

#### COMPRESSION GAGE COCK IMPROVES BLOWTORCH

If the needle valve on many ordinary types of blowforches is left clused after use, the contraction of the metal around the hole against the needle valve may enlarge the hole and ultimately make the torch weless. Of course, the ( needle valve may be left open and the pressure let out of the tank by unscrewing the pump, but a better plan is to thread a compression gage cock into the log of the tank under the rear end of the burner. A cock of the needle variety must be used, any other kind will leak. As the thickness of the tank metal is too thin to support the cock properly a ridge of solder should be built up around the base of the cock

When through using the torch, entinguish the burner, reopen the valve, and then open the compression cock .- A. L. Evans.

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#### GUIDE FOR ANGULAR CUTS IN CYLINDRICAL STOCK



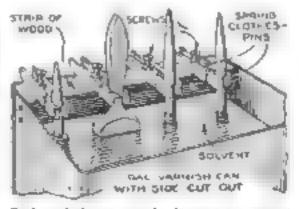
How to he ditubing dowels, and other by in-

of briss of steel tubing, or even brooms icks dowers or other wooden cylinders at a given angle and have all cuts exactly alike. A good way to accomptish this in to make a sort of miter box from a piece of hard wood an inch or more thicker than the outside diameter of the cylinder to be cut and wide enough to be held firmly in the vise. Bore a hole through the block large enough to allow the cylinder to be pushed through easily, but not too loosely. Make a cut or cuts in the block at the required angle or angles.

As there is always a tendency for the stock to turn while being sawed, it is well to scribe a line the entire length of the top of the cylinder as at A and make a corresponding mark on the block at B. If care is taken to see that line A on the cylinder and line B on the block coincide at all times, the cuts will be uniform and will match each other accurately—A K C.

## HANGING PAINTBRUSHES IN CAN OF SOLVENT

AMATEUR painters frequently find it a problem to keep their brushes soft. My plan is to cut out one side of a 1-gal varnish can and put a strip of wood along one of the top edges as shown. To this strip I fasten several spring type wooden clothespins by passing a screw through



Spring clothespins make it easy to support the brashes so that the bristles are covered

the spring of each. A quantity of whatever solvent is to be used in then poured into the can, and the brushes, whatever their length, are suspended from the clothespins so that the bristles will be covered by the solvent yet will not touch the bottom or sides of the can. An improvement would be a cover to go over the entire can as a protection against dust.—Kenneth Bannes.

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#### BRAIDING FLEXIBLE LEATHER HANDLES

The hearding process in eliuntented

above, while the dougtage above the

arrangement of though at the start

UNUSUAL handles sure for a concern rety of uses can be more free actions of a braided sweeth and or use on a floor lamp that was been action matches the lamp perfectly

obtain some calfskin or smaller leader in sheet form, and cut some another, with depend on a size of the bandle, but per some spliced if necessary by beveling the ends and fastening with a good leather glue

Arrange four though so that they are an anght angles to each other and compoint 2 in from one end of each piece Each though in this position, will crottwo others—over one and under the other as shown clearly in the photo below and in the accompanying diagram. Now bring the

short ends together and clamp them in a vise, or tack them to the workbench. and proceed to braid the bandle in the manner illustrated. In bringing over the first thong to start each round, leave a loop through which the end of the last thong can be passed Draw all pieces tight before proceeding with the next round.

Leather comes with only one surface finished. If the thongs are laid with the finished sides up at the start the com-

pleted handle will have, on each of its four surfaces, a strip of finished leather paralleling a strip of unfinished. This arrangement can be varied by turning two of the strips over at the start. The design can be modified further by using different colored though in any way desired

The completed handle will not unravel

This de unit we have an increase and a manage of the analysis of the analysis

unless the ends are trammed close. In that case, apply a little adhesive. The method of attaching the handle to a cord or other object will depend largely on the object

LEATHER STR PS

Lea her is not the only material that can be braided in the manner described. Heavy cord, rope, flexible wire, and the like can be used.—Vianon B Case.

# FEATHERED CORNCOB DARTS USED IN TARGET GAME

DARTS made from long straight corncols with four turkey or chicken wing feathers inserted in the buttend of the cob as shown may be used in an outdoor target game for boys. Place the back of each feather toward the center of the cob in order to give the dart a spinning movement when hurled through the air. This will belp a good

deal to insure accuracy and higher scores

Each player tries to place a dart as close
as possible to a stake driven in the ground
at a suitable distance away from the line
on which the contestants stand. If preferred, a bull s-eye may be marked on the
ground and scoring rings used, but there
abould be a stake in the center to aim at
This is the arrangement shown in the
drawing above.—George A. Smith.



#### HOW TO WATERPROOF MATCH HEADS

MATCHES to be used while camping can be made entirely waterproof, and they will also hold a large flame when lighted in the wind, if the heads are first dipped in a celluloid solution and allowed to dry. The solution is made by dissolving celluloid scraps in acctone.—G. S. G.

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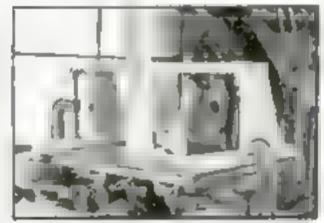
Adams



#### TENON CUTTING GUIDE FOR CIRCULAR SAW

ACCL RATE tenous can be cut on a small circular saw with the help of the auxiliary fence shown in the accompanying illustration. This device is made of I in stock fastened throughout with screws. It may be built to fit whatever saw it is to be used with, but in any event the elevated cross member should be at least 10 or 12 in, above the saw table

Before the auxiliary fence is put in place, the regular fence on the saw table is set properly to cut a tenon of the desired width. It is possible to do this so that first one side of the tenon may be cut and then, by reversing the stock, the other side, without change of fence ad-



This quickly made qualifiery fency helps to cutting tenons accurately on a calcular saw

Justment. The naw table is, of course, set to cut the right depth-in this case, the length of the tenon.

To function properly as a guide to the stock being cut, the inner edge of the upper cross member of the auxiliary fence must be in the same perpendicular plane as the inner face of the regular fence on the saw table. This may be insured by using a carpenter a steel square with one edge on the saw table and the other edge against the inside face of the regular fence, extending upward. The square should be used first at one end of the fence and then at the other, and the edge of the auxiliary fence must touch the Muare at both points

When properly aligned, the device is held with C-clamps and the tenon cuts may then be made. The operator must he careful to hold the stock soughy against he auxiliary fence as it passes through he saw -A V Costives

#### NOISE-MAKERS FROM RYE AND WHEAT STALKS

STE OR

MARTE

WHISTLE

TONGUE

) air

Maxy boys have never learned the old rick of making a sort of whistle from a stalk of tye or wheat. Simply pull off the leaf around the upper joint of the stalk and cut the stalk as indicated. Then use a sharp penknife to cut a narrow tongue close to the joint end. This curious little instru-

ment is blown by placing the lower end -that with the vibrating tongue-in one's mouth.--G. S.

# XPERT The SHARPEN



Hoto your chisel as shown, and take even, smooth strokes until a "bute" or wire edge is created. Do this on the course-grit side of The Carborundum Brand Stone

Now, turn the stone over, flatten out the angle at which your chisel meets it, and take Just a few light atrokes on the fine side of the stone.

To remove the wire edge, return now to first angle of holding your chisel and take a light stroke or two, pull on fine-grit side of stone-and-

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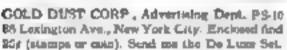


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the most popular of all ship models picturesque, rich in ornamentation, brilliant in tolor, yet easy to construct. To buy the materials separately would require hours of shopping, and the cost would be higher This new kit is marked D in the list below. which gives all the kits offered by the Popular Science Homecraft Guild. Instructions or

No. 1. Colonial maple butterfly table with eval top 17 by 22 in., and 22% in No. 2. Solid mahogany tray-top table 23

in, bith with a 15 in, diameter top. Ready

to assemble..... 5 00 No. 3. Tilt-top coffee table in selected

maple with top 19 by 28 in., and 21 in high No. 3A. The sense table in solid ma-

hogany. Ready to assemble...... 8.15

all. Ready to assemble .......... 5.30 A. Whaling ship model Wanderer, Ail the raw materials—wood, wire, fishing line,

chain, celluloid, and everything but the paints. together with Blueprints Nos. 151, 152-153.

B. Folding multin stand in selected sugar pipe, 11 in. wide, 19 in. long and 33 in. high

when open. All the necessary wood cut to approximate sizes but not machined... 290

No. 4. Solid mahogany book trough 221/4 In. long, 91/4 in. wide, and 241/4 in. high over

blueprints accompany each one.









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MITS B AND C

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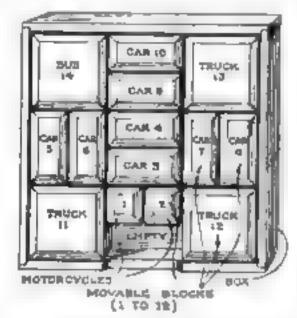


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#### CAN YOU SHOW GUS AND JOE HOW TO SOLVE THIS PUZZLE?

HERE is a plan of the Model Garage after Gus and Joe have put in a particularly strenuous day. They are at home relaxing but as usual they have left the garage all spick and span, cars packed in closely, and locked up for the night.

But trouble is on its way! The bus driver has received a hurry call to get his bus out and go to the railroad station for some stranded travelers. Of course his bus would be right at the back of the garage, Can you help Gus and Jue in this emergency to move the bus over to the doorway ready to run right out?



The problem is to move the but (No. 14) to "doorway" simply by shifting the blocks

You can do it without taking any cars out of the garage and without turning a single one

The puzzle is worked with fourteen pieces cut from wood or cardboard, they may be of any convenient size providing the proportions are as shown. Thin wood blocks are easier to shift bround than cardboard, and they may be left plain or finished neatly with beveled edges. Giveeach block its identifying name and numher Then prepare a shallow box or tray to bold the puzzle

The object is to move the but (block No. 14) to the garage door-the space now partly occupied by motorcycles Nosi and 2-without removing any block from the tray. The blocks must not be turned For example, car No. 6 cannot be turned to a position like that of car No. 3

For those who wish to check their solution with that originally made by the writer the sixty-three moves are as follows, L meaning move to left, R to righ-D down, and U up: 1D, 1 R 11 R 5 D 6 L. 3 L. 4 L 2 L I L. 1. R 5 R 6 D 3 L. 4 L 1 L 1 L 3 R + D 14 D 10 L 1 1 L 2 L 3 L 4 R 14 D 10 D 9 L 2 L 2 L 13 L 8 L 7 R 3 R 4 R 1 D 2 D 43 L 8 L 7 C 3 R 4 R 1 R 2 R 14 R 6 L 5 L 11 L 1 D 2 D 14 R 6 R, 5 U .. L, 2 L. 2 D (4 D 3 L, 4 L 12 L 1 R 2 R 14 D

After many attempts to better this record, a shorter solution in fifty-nine moves was discovered. Perhaps you can find that one, too Here is a hint do not move truck No. 13 at all-Ente B. Roberts



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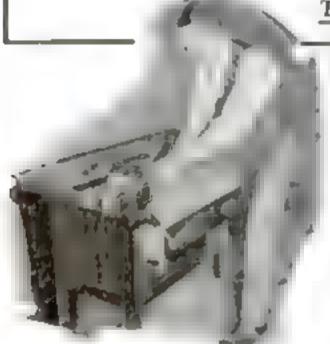
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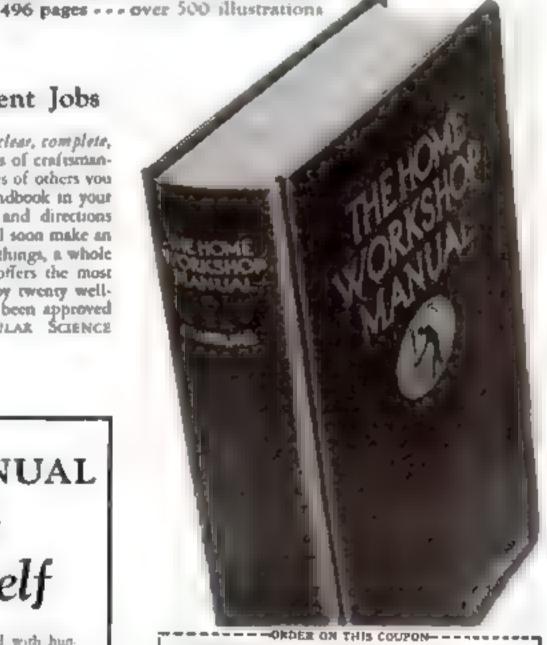
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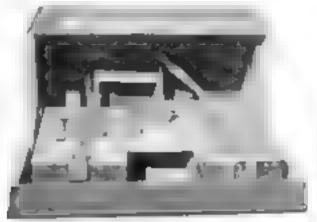
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PART ONE-The Foundry Box

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Many broken mechanical puriscan be duplicated and replacer amply by using the broken purces. temporary god a for as a maker, his as ke I is ings its all a ling to the for the metal parts of his models and the experimenter and inventor can cast and recast until per-

fection is attained. All the equipment required for an outht suitable for this work does not cost two dollars, and any handy man can make the kit

One of the accompanying photographs shows the home foundry box closed; another shows it open with all the equipment

By Joseph G. Gilbert

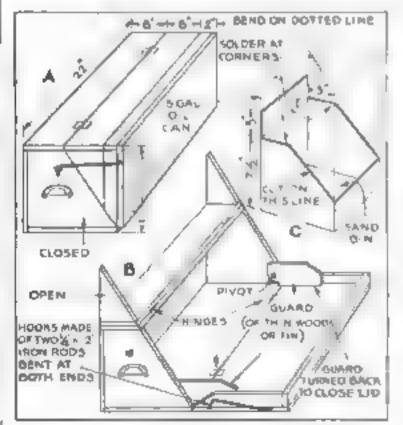
and tools made, the third shows a complete mold opened and with four small patterns on the board resting between the cope and drag, and the fourth, on the following page, shows the flask on the lid in position for molding

Among the parts the author has cast with this equipment are the

fittings for several Spanish gal leons and other show models an aluminum bandle for a carving knife, a crank shaft, a 9-in propeller blade, and small anchors and cannons

The box is so designed as to keep everything needed within one unit that can be moved and stored anywhere. It also prevents the loss of sand caused by spilling it on the beach and tracking it over the floor

A ready made box is used but it is aftered as shown in the drawing. The over-all size is 11 by 14 by 22 in., and the stock as I in thick throughout The back and top, bowever could be thanner in fact ! in, stock would be heavy enough. for them, First the box is nailed all around excepting along the lower front corner where the binges are to be fitted for the lid. When this has been done, line off the ends and top



The box is cut apart and hinged as shown at A and H, and the tin sand bin made from an old oil can as at C



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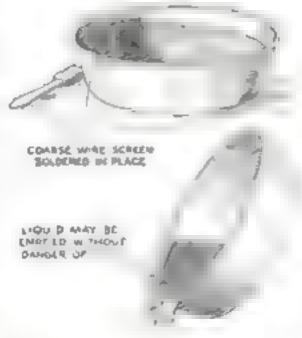
Another view of the kit which shows where the flash is placed on the lid for molding

as indicated at A. Cuts are then made along these lines, and the parts are hinged so that they will open as shown at B Note the two guards or filling pieces of thin wood or tin; they are turned back before the lid is closed.

The bin for the sand is made from a 5-gal, oil can by cutting it as suggested at C. The 3 in, wide flap at the back is bent forward and soldered at each side where it meets the ends. It is best to paint the inside of the ban to prevent the tin from rusting

In two articles to follow Mr Convert who has had thirty-three years of practical experience in foundry practice, will explain what foundry equipment is required in a home workshop out fit and tell exactly how to make small castings

#### A SCREENED WASH PAN FOR SMALL PARTS



WHEREVER a large number of small machine acrews and parts have to be washed in gasoline to remove grease and grame, as in garages and repair shops, valnable pieces are often lost or overlooked and thrown away with the used gasobne To avoid this, a repair shop mechanic soldered a section of heavy screen wire over part of the top of the wash pan as illustrated above. Small parts can be placed on the screen for washing with a brish. The same screen also serves to salvage any parts accidentally left to the pun G E HENDRAKS N





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# Small Battery Charger

SUPPLIES CURRENT FOR

# Nickel Plating

R. H. ROGERS

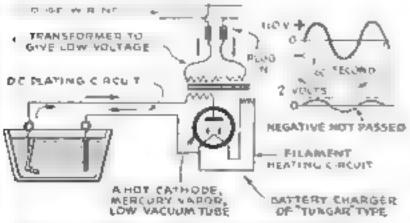
NY boy who has a battery charger of the "tupgar" type in his home can do practical nickel plating for fun or profit, Experimenters, too, should be interested in this electrochemical process, especially as it

employs a vacuum tube. The work turned out is of standard commercial quality

To do nickel plating one must have a source of low voltage direct current electric power, a tub or jar, and some nickel salts and nickel castings, called "anodes which can be obtained from dealers in electroplating supplies. The battery charaer furnishes the direct current at the proper voltage from the alternating current house circuit. An old battery box, a sawed-off wooden ice cream tub, or an earthenware cruck will serve for the elec-

the objects to be plated on the other anode rod, and the negative (-) lead to the other rod, and turn on the current

trosytic cell. Make up the solution according to the instructions which accompany the salts and put it in the cell Lay two rods across the top (old brass curtain rods are satisfactory) and hang the anodes on one and Suspend the articles on copper wires and see that the solution covers them. Counect the positive (+) lead from the 2/4volt tap on the battery charger to the



Diagrams showing the connections for electropiating and why the battery charger gives current autable for plating

In a period of from one quarter to half an hour or less, depending upon the voltage used and the surface area of the particles, a fine hard conting of nickel will be found securely plated on the work, A heavy, long-wearing coating is white or gray-white and doll, therefore a small motor and cloth buffing wheel are needed for giving the objects a high polish. Thinner plating—that put on in a shorter time -has a good gloss without buffing, provided the work was ariginally smooth

Articles to be plated should be thoroughly scrubbed with a strong washing powder and well rinsed. The test is to see if water adheres to the whole surface if it does, the solution will make a good contact and a satisfactory plating job will result. The rods should be rubbed occastonally with sandpaper to insure a perfect contact. No two articles should touch each other in the solution, nor should they touch the anodes

There are many things about the home that can be improved in appearance and made turnsh-proof through nickel plat-

> ing-radio parts, automobue and bicycle parts, plumbing fixtures, tableware, door and window hardware, fine tools, boat fittings, and the like, In fact, there is no reason why a boy cannot earn extra money by doing plating for neighbors and neighborhood business concerns. The charger will then do double dutykeeping batteries in good shape and providing curreat for plating.



#### Confidence-and Cash

The R.J. A. tenlaing has taught the bow to write a gend news story, and why it should be writ-ten that way by appropried the knowledge I was enabled, before quite completing the mand, to sell a feature stury to Seventished Mayor no for Rd. That resulted Magnet we for \$20. Third resulted to no immediate management to do not attend for the parameter against the more during fortune and time a but one which share surp published, her one to covering in he M. A. and or of writing in he M. A. and or of writing in the best published their managements in the first E. Louis and the control of the control of

#### How do you KNOW you can't WRITE?

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Or have you been sitting back, as it is so easy to do, waiting for the day to come some time when you will awaken, all of a sudden, to the discovery, "I am a writer"?

If the latter course is the one of your choosing, you probably never will tertie. Lawyers must be law clerks. Doctors must be internes, Engineers must be draftsment. We all know that, in our times, the egg does come belore the chicken.

It is seldom that anyone becomes a writer until he (or she) has been writing for some time. That is why so many authors and writers spring up out of the newspaper business. The day-to-day necessity of writing-of gathering material about which to write-develops their talent, their insight, their background and their confidence as nothing else could,

That is why the Newspaper Institute of America bases its writing instruction on tourna sm. continuous writing the learning that has produced so many successful authors,

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#### HIGH-FLYING PLANES TO RACE SUN

(Continued from page 13)

closing an air tight batch believe him, and the machine continues its upward climb with compressors driving fresh air at sea level

pressure into the cabin

In the Junkers craft, the compressor is driven by a windrall outside the ship. Thus, independent of the engine, it continues functioning even if the motor stops. Another feature of this machine is a special apparatus that draws off carbon dioxide from the sealed cabin during a flight. All the stratusphere ships will carry reserve tanks of oxygen that can be turned on in an emergency if the compressors fail. Throughout the journey, the pressure and oxygen content of the air inside will be kept constant. To prevent air leaks, the moving control wares will leave the caten through rubber openings and boxes of oil

Because internal pressure will be far greater than external, at the peak of the climb, the cabens are specially reenforced to prevent them from exploding outward as a deep-sea ash bursts when brought to the surface

For every mile a plane climbs into the air uptil it reaches the stratosphere, the temperature drops about fifteen degrees. Throughout the stratosphere, the temperature is believed to remain constant at about sevenly five degrees below zero, Fahrenheit. Finding new alloys to stand this better cold was another problem the engineers had to solve. Ordinary hard metals become brittle and fragile at low temperatures and so are unsuited for use in the vital parts of a stratosphere ship

PROVIDING heat for the cabins, however, automatically takes care of itself. The compressors turn at such speeds that the friction of the blades on the air heat it while it is being driven inside. At some altitudes. the air coming from the compressors is expected to be too hot and special radiature are provided to cool it

All three of the mathines will use fourbladed propellers of huge diameter to grip the thin air. The 430-horsepower inverted "V" engine on the sixty-one-foot Farman place will turn a fifteen-foot forged-steel propeller with blades of variable pitch. As the machine mounts, the pilot can turn the blades to a greater shale so they will prip more alr

Supplying oxygen to the motors is almost as important as supplying it to the cabins For the power developed depends upon it Superchargers, forcing air into the cylinders under high pressure, will keep up the efficiency of the stratosphere engines in the rarefied atmosphere in which they will operate. The 800-horsepower motor on the low-wing, sixtyfoot-span Junkers monoplane, and the eighteen-cylinder, 700-horsepower untine of Guerchais' graft, will both receive the compreseed air from single superchargers. On the Farman plane, a battery of three smaller ones will go into action one after the other athe machine ascends. The first will begin work at 20,000 feet, the second at 30,000 feet, and the last at 48,000 feet. All three will be turning 25,000 revolutions a minute as the plane passes the 50,000-foot level

IN A test tank at the Farman plant, the motor developed 300 horsepower when the air pressure and oxygen content were reduced to approximately those found at an altitude of 62,000 feet. The perfection of new superchargers in expected to lift the ceiling for thin-air planes to between \$0,000 and \$0,000

Not long ago, the Italian encincer, Italo Raffacili, announced he has designed a steam turbine that will actually give more power as it ascends, thus making it ideal for use on the high-altitude air lines of the future His engine weighs nine pounds per horsepower and uses naphtha for fuel.

Another suggestion for adding to the power of a plane at high levels has just been advanced. by a German scientist. Since the drop in pressure between the exhaust gases and the surrounding air would be very great in the stratosphere, he points out, the engine might carry an eshaust-gas turbine to give extra power during such flights,

Long distance aut takes by stratosphere planes are visioned as a feature of the next war, Military authorities, as well as air transport operators, are watching closely the tests under way. In fact, the French Air Ministry is actively cooperating with the Ferman plant in the development of its ma-

Construction of the three planes now bring groomed for the spectarular race to reach the stratosphere was begun soon after the Swiss scientist, Augusta Piccard, and a companen in May 19 1 sourced to a height of 51 5 (ec) in an air-tight atuminum ball along beneath a bale on inflated with hall a million cubic feet of litting gas. Data collected by this Columbias of the upper alraided designers in their work, Early this spring, Piccard began preparations for his second voyage into the unknown for further observations.

THE highest point in the sky at which any second has been made is something over twenty miles, reached by small sounding balloom of the Weather Bureau. The record for airplance-43,166 feet, set in 1931 by Lieut. Apollo Soucek of the U. S. Navyfalls more than a mus short of the lower fringes of the stratosphere

Penetrating these upper reaches, where planes may some day race the sun around the earth, is the next important stride in flying. The trail-blazing machines of two nations, now tuned up in Europe, promise to lead the way to this new scalin of travel.

#### USE BAKED POTATO IN REFINING GOLD

Revisive gold with a baked potate is the unusual method employed by some amateur. gold hunters who, because of unemployment, are making a living by extracting small quantities of the precious metal from the sand of streams in the west. The specks of gold are first removed from the sand his amalgamat ng them with mercury. A small quantity of the amalgam is then placed in the heart of a large potato. After the potatohas been baked until the mercury has evaporated the ashes are panned for the pure gold. In larger quantities, the quicksilver is evaporated from the amalgam by using a retort

#### NEW MACHINE COUNTS TINY GRAINS OF SAND

A privice that counts sand grains has been invented for the analysis of sediments by J. E. Appel, University of Chicago peologist. Fitting on the end of a suction hose, it is equipped with a thin brass plate containing 300 minute holes. Since the holes are smaller an diameter than the grains being counted, a single grash is attracted to each bole and is held there by suction. When every hole is bolding a grain, the sand is carried off to a separate pile and another 100 grains picked up. In the past, the painfully slow process of counting has been done either with the naked eye or under a microscope. With the new device as many as 10,000 sand grains an hour may be counted

#### HELP YOURSELF TO A HOME

(Continued from page 21)

weary of the city, so he wrote to the register of lands at Los Angeles asking where, in Canforma, he could find land to homestead

In reply the register sent him a list of all counties in California with the character of the lands set forth, level, grazing, desert, tembered, mountainous, agricultural.

He found in the envelope, also, a booklet entitled "Suggestions to Homesteaders and Persons Desiring to Make Homestead Entries." in which he found a paragraph informing him be first should pick out the land on which he desired to enter then obtain from the land office a township plat showing what lands in that particular area were available. Having definitely located the plot, he again went on the land, prepared affidavits swearing he was acquainted with the land, that it was neither to neral nor saling, that he was capable of improving the land, that he was acting for himself and would in good taith make his home there

Within six months he was required to make his home on the quarter-section selected, and thereafter to make his residence on the land in accordance with the rules.

OSBORNE didn't wait for six months to esapse however. Within a week he had rolled his bedding and, with Mrs. O-borne, drove his automobile across the mountains to the site of his new home

Slowly he cleared one corner of his tract. Meantime he built the two-room shack that today serves as home and store for he, too, found he had located on an occasionallytraveled desert "highway" and could cash in on the wants of his neighbors

Uncle Sam told him he would be required to have crops growing on at least ten acres by the end of the second year and on twenty acres in the third year. So down went a well a theusano, ert west of his home, near a depression on the property, and there be grows his crops.

"The trouble with most homesteaders" Osborne told me recently, "lies not in the land but in themselves. The povelty of fighting with nature wears off and some give up If they only would come with moura e capital, a few bundred dollars, they would find they can make a go of it."

HOMESTEADERS can help guarantee their own success if they will bear in mind these simple but important rules

I-Go on the land during the most unfavorable season of the year and study its characteristics.

2-Learn when and in what quantities raut falls

3-Learn whether you are picking land in a frost belt and how cold the winters may be

4-Talk to the natives of the neighborhood, particularly the old-timers, for they can tell you more about the land than Lucke Sam

5-Above all, study the soil and water supply. In some regions state universities can supply helpful information.

6-Don't expect a big crop during your first year on the land, and be prepared to stick out the first seven mouths with plenty of food and a substantial tent or cabin

Exactly what part of the remaining two handred milhons of acres are su table for homesteading no one knows, not even Uncle Sam. Fifty million acres have not even been surveyed. You'll find 346,037,591 acres in Alaska; 51,399,000 acres in Nevada, which leads the other states in available acreage. 25,157,000 acres in Utah , 16,046,000 acres in California

With the re- (Continued on page 98)

#### Small Ideas May Have Large Commercial Possibilities

If you hope to realize profits from your invention, you must prowet it with a b. S. Government Patent. Otherwise you may find but all your time and labor have been four because it often happens that other inventors are working on the same idea. IF VOU HAVE AN IDEA, TAKE STEPS TO GET A PATENT AT ONLE? Your first step is to get my FREE BOOK. It tells the enterprise print and analysis and the state you must be been your tour placed a sole to secure l'atent plotes con-



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#### HELP YOURSELF TO A HOME

(Continued from page or)

cently increased demand for homestead acres, some people have shown a fine disregard for the rights of others. The most audacious attempt at stealing, or strong-arming land, has appeared in Los Angeles where more than 2,500 applications for homesteads on old Mexican land grants have been rejected by the land office

The nearly 3,000 people who have literally demanded that Uncle Sam turn these valuable properties over to them disregard the ruling of the U S. District Courts in California that these Mexican land grants, issued before the United States purchased California, are valid. Such was the clamor, in fact, that only recently Senator Bratton, on behalf of the Senate Committee on Public Lands and Surveys, reported that these old grants were legal and valid and that land-hungry applicants waste their time and money in trying to raid California cities and ranches, hogong to homestead tracts worth, in some instances, a hundred million do are

#### **B-CURRENT FOR** YOUR RADIO

Continued from page 571

of the B-supply portion of the transmitter Remember, the law requires that the Bsupply of amateur transmitters shall be filtered direct current, and if the single twomerofared condenser at C. which should have at least a thousand-volt rating, does not give sufficient filtering action, a filter choke coll and another condenser can be added as in Fig. 1

Of course it is obvious that more power can be obtained from the B-supply of either Fig. 1 or Fig. 2 If a twelve-volt storage battery is used instead of a six-volt unit. In any case the current in amperes drawn from the battery will be many times the actual current obtainable from the accordary or B-

supply, The cost of building a power unit of either type will be quite low, Old spark coils can be bought for very Bille and 201A tubes or a gaseous rectifier tube are also low priced If you prefer the huzzer integrupter circuit of Fig. 1, It should be possible to make the interrupter itself out of an old electric bell by rewinding with much beavier wire and fitting a long spring armature. If the armature vibrates too slowly, cut it off, a piece at a time, till you get the equivalent of sixtycycle operation.

#### "PHON" IS UNIT USED IN MEASURING SOUND

LATEST among the words to join the vocabulary of science is "phon," a unit of sound devised at the Berlin Institute of Technology, in Germany. Research workers at the Institute are busy classifying sounds ranging from the yelp of a dog to the roar of a locomotive, according to their strength In phons. The trill of a nightingale, they found, has a strength of twenty phone, a spotting fountain, filty phone, an automobile horn, ninety phons, and a motorcycle with the muitter cut out, 102 phons. All common noises, the experiments indicate, can be classified between one and 130 phons. Any noise above 130 phone causes pain in the care of the auditor. The new unit is expected to prove valuable in providing a standard gage for classifying city noises and for referring to the strength of sounds in lawreits.

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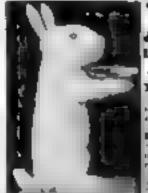
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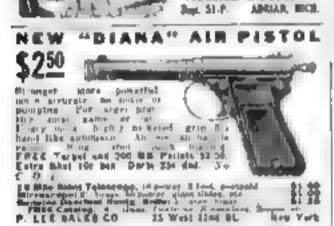
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#### ROBBERIES ON A GIGANTIC SCALE

(Continued from page 47)

gers, but the judge failed to see the funny side At Morrislowa, N. J., a new \$4,000 fire engine was purchased for the volunteer fire de-

partment. Three days later a small boy reported it missing from the fire hall. A frantic search discovered it in the woods, six miles away, and undamaged.

Celebrating July Fourth a couple of years ago, a Pennsylvania citizen espied a steaming locomotive. He knew nothing about driving locomotives, but he clambed into the cab, and a few minutes later had it on the main line A modern safety device cut short his joy ride by tripping a lever and bringing the engine to a stop before it could wreck a speeding express. The celebrant got off with a fine o. \$50

AHCMBLE "gob," late of Uncle Sams Navy, beat this last example of absent manded borrowing. Tired of life in the Philip pages, this sasior clumbed aboard the futreged a yacht that was lying at anchor Having considerable skill as engineer and navigator, the sailor headed for the nearest point in China, and was well on his way before the yacht was messed Two roaring Navy seaplanes spotted the yacht steaming merrily along about sixteen miles out

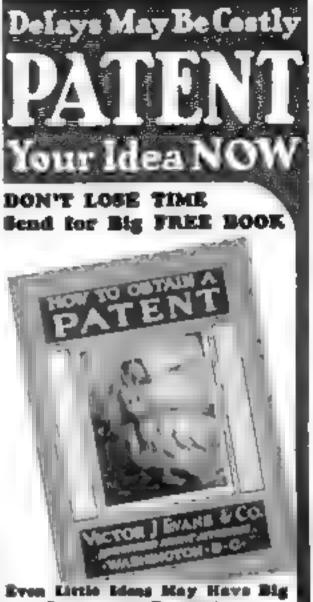
A similar affair brought a one-legged Min neapolis newsboy to grief. He was found in a bunk, half dead from seasickness, in the stolen yacht Jalome, sixty miles out in the Attantic | Arrested for grand larceny, he told an apparently straightforward tale of being persuaded to go for a trip to see yacht races off Newport, the goodlooking stranger fatting to mention that he was stealing the yacht. The latter after lashing the wheel and setting all sails, had described his sensick passenger and set of for shore in a tender. He may have been lost at sea, as a thick fog enveloped the region . and the yacht, sashing in circles, was nearly rundown by a fishing trawler,

More disastrous was the yacht-stealing case of Frank Pollo, who stole a yacht in New York. No one knew where it had gone, and it was a great mystery until found wrecked on an island off the north coast of Holland, last October. The man, found dead, apparently had made the transatiantic crossing alone in the motored sailing yacht. Overtaken by a storm, he probably had been driven ashore

ALL these instances of mass production in the very fade into insignificance before the exploits of European masters, who do not depend entirely on their own efforts. In one small country, a firm was employed to build a lunael, in territory formerly Austrian. For seven years regular reports showed the progress of the tunnel, men employed, material removed, and so on. The government paid the contract price, and at the grand opening officash found a few workmen cleaning up the debres. The tunnel was there and the contractors were congratulated

An encureer, celebrating too hotslerously the completion of his arduous task, proved the undoing of these "contractors." He revealed that the tunnel had been dug six years previously by Austrian and German troops, who had abandoned it when the war front shifted. The firm had received five and a balf million dollars for digging a hole in the ground that already existed!

If that seems incredible, what of the discovery announced a few years ago by the Prime Minister of Rumania? He reported that un entire railroad-rails, ties, switches, spikes, even rolling stock and signal system-had completely disappeared! Constructed in wartime, from Cluf, Transylvania, to Jacobeni, Rumana, it was said to have cost almost four million dollars. Apparently it had been dismantled piecemeal and the parts sold without exciting suspection.



## Commercial Possibilities

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#### CAR'S AMMETER CAN WARN OF IGNITION TROUBLE

(Continued from page 60)

thing that keeps it from burning up is the fact that it only has to run for a few seconds at a time

"Now the generator is a different proposition. It's on the job as long as the engine is running above idling speed. So it's designed to produce not over eighteen or twenty amperes and it keeps the battery charged only because it runs a lot longer than the starter motor If you tried to make a regular size generator produce more current than about twenty amperes, it would soon burn out

Mechanically, too, there are deferences The bearings on a starter motor are pretty crude because they don't have to stand steady running. Generator bearings, being made for continuous use, are much more durable

"The copper brushes needed to cut down the resistance and let lots of current through the self starter motor windings are not nearly as good for steady use as the graphite carbon britishes teled on the generator "

"THAT remands me," Dilhow cut in. "The self starter on my old car docur't always work. Sometimes when I step on the pedal it turns the motor over in a sort of a rough, bumpy way. The next time, it won't ster at all. What's the matter?"

Turn on the headlights and watch the ammeter when you step on the starter," Gusadvised. "If the starter takes hold and the needle flukers to beat the band or the starter. doesn't work at all and the needle stava still, probably the self-starter commutator is worn and burned so badly the brushes only make contact part of the time

"There are other throas the ammeter needle tells you about your electrical system " Gill went on, "It shows you whether or not the generator cut-out is working, besides telling you when the generator is on the Job. It tells when one headlight burns out by the difference in the needle position It shows you what bappens when you move the third brush and how much to move it to get the result you want. If the motor suddenly cuts out when you're breezing alone a quick glance at the ammeter will tell you whether to look for a break in the primary senitum wiring, something gone wrong with the breaker points, a burned out condenser or a shorted distributor head "

"How do you tell that?" Difbour asked

"S IMPLE enough," Gus emplained. "When the ignation system is working, it takes current and the needle shows on the decharge side. If the primary circuit is open or the breaker points have backed away so they don't touch or they're burned so badly they don't let any current through, the needle goes right back to zero. If the needle acts as usual, you can be sure that the contacts are working and the trouble must be in the condenser, the high tension winding of the coil, the high tension were from the coil to the distributor, or the distributor head

"See how this all branes you right back to the new invention of yours," Gus added, fingering the drawing. "You'd never have wasted any time on this idea if you'd figured out what the ammeter shows. It's really like a gage you could put on a water pipe to show you how much water is flowing

"I get you," Dilbow observed, "The starter motor uses electricity by the bucketful for past a few seconds and the generator puts it back, a spoonful at a time, and the only reason it works at all is because the generator is on the job all the twoe."

Slowly he tore the brown paper plan into long, this stript. "I guess I won't waste any more time trying to get something for nothing! he decided ad 17

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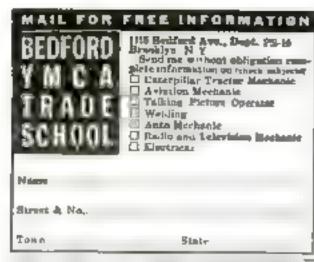
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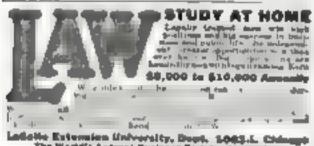
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#### OUT OF THE AIR ON A BAG OF SILK

(Continued from page 37)

of the watch and when the excitement ended the hero of the day was the pilot parachote

A week ofter New Year's in 1924, I was flying a "Jenny" biplane, with an OX motor, rast of Indianapolis, Ind. Heavy snow clouds were piled low in the sky. At frequent intervals drifting fingers of fog hung down.

About 4.30 it began to grow dusky. I was flying wide open, trying to make Dayton, Ohio, before dark. East of Knightstown, the fog fargers became more frequent, I had burst through three in rapid succession and was coming out of the fourth when the ship suddenly seemed to strike a stone wall in the sir. I was entapulted against the instrument panel. There was a ripping crush. The plane trembled all over, reared skyward, and then began to fall.

Another barnstormer, racing toward Indianapolis, had crashed into my ship without seeing me. Flying a few feet above mo, his landing geer had struck my upper wing head-on, smashing it back over the cockpit bke a lid on a pot, pinning me la

FOUGHT to push the wing away and jump. I fought to push the wing angle and the pressure of the wind glued it in place. A giant couldn't have budged it. The opening between the wing and the front of the cockpit was too narrow to worm through. All this time, the ship was falling.

I kicked through the canvas side of the fusciage and tried to wattle out backward under the inverted V of the crossed bracing wires. The space was just too small. One wire leg of the inverted V pressed against the back of my sculp, the other dug into the back of my ankles. Doubled up like a jockknife, I struggled to squirm free, but I was sammed fast

The scat-type parachute I was wearing was outside the fuscinge. I took a last desperate chance. Pushing over the rudder bar with my hand, so the ship sideshipped violently away, I jerked the rip cord. The silk, trailing after the pilot 'chute, streamed away from the plane. It popped me out the opening. scraping chunks of skin from the back of my beels and scalp, but pulling me free

It seemed only a second before I landed hard on a snow-covered field beside the railroad, where the other flyer scraped to a safe landing on the bottom of his finelage. I had broken out of the ship at less than 000 feet. Although I was jolted and nore for a week afterwards, I had escaped, thanks to the quick opening of the mik, dragged out by the pilot 'chute.

THAT was the lowest jump I ever made. The higher, the safer," is an old saying among professional parachute men. In exb bitton drops, they rarely dive off a plane below 2,000 feet. Then, if anything happens they have time to work the 'chute open before they bit. Once a veteran said to me "Never quit fighting a parachute if it doesn't open right away "

I remembered that bit of advice later on during an air circus in northern New York At 7,000 feet, I dropped from a wing and reached for the rip cord ring, located on the sell ude of my harness. I Jerked but the ring didn't budge. I tugged barder. Still it stack. I had to give four violent togs and finally use both hands before I could open the 'chute. I plunged nearly 900 feet before il was open.

In a long fall, a jumper tenses the muscles of his chest and shoulders just as the 'chute opens to take the shock of the sudden jerk. in alowing down. Most people think a parachute opens like an umbreila. As a matter of fact, moving (Continued on page 102)

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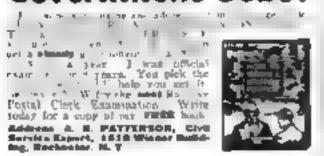
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#### OUT OF THE AIR ON A BAG OF SILK

(Continued from page toil

pictures of chales opening in the air show that they fill at the center first the edges spreading out last of all. Thus they bey n to show down becore the whole expanse of a k is open. When a jumper is upsue down in the air as he jerks the ring, this initial slowing down turns been right side up before the big jerk coross. Otherwise, the sudden sump might break his neck, Incidentally, it is a wise thing to keep your teeth set until the parachute is open, otherwise the Jerk may make you bite your tongue.

Dan Smith, the famous Army jumper who made more than 1,500 parachule drops from planes, used to take 300-loot swan-dayes into space from the wings of my ship at Rochester, N. Y At the time he was doing parachute work for the Reynolds Airways. His favorite method of taking off was to make a cartwheel from the wing, spinning head over

heds until he jarked the rip cord. During one of his first jumps in the Army, Smith had a breath-taking escape when he fell through the tail of a De Havilland biplane He was crawling out on the wing for a jump when he slipped and fell. At the same instant, for some unknown reason, the pilot pulled up the nose of the ship into a climb, dropping the tail. Smith crashed into it, breaking his nose and bruising himself in a dozen places Only half comotions, he clung to the streamlined bracing wires until they cut his hands to the bone. When he was sure his parachute was not hung up anywhere, he dropped from the tail, jerked the ring, and made a safe

BECAUSE a parachute streams up sevents feet or more when the pack is opened, the jumper must wait until he is more than that distance below the plane before he jerks the rip cord. Usually beginners are told to count three slowly before they reach for the ring. If the parachute is opened too soon, it is likely to fool on the tail of the plane and tear.

landing

Army airmen making their first Jumps are given two 'chutes and carry a knife in a special pocket attached to the barness. Then if one parachule fouls, they can cut the shroud lines and descend safely with the second Another recent requirement is that stryice men make at least one jump with a parachute which they have packed themselves

Sometimes, in exhibition leaps, men come down with two or more 'chutes open. I remember once last summer, Joe Crane, the tamous jumper at Roosevelt Field, L. I., drifted down with four open at once. In such a jump, no two rip cords are pulled at the same time. Each 'chute is opened separately to prevent fouling

WHEN a jumper in carried out over a take or river he should aw m as far as possible underwater in the direction from which the wind is blowing before coming to the surface. If he comes up under the parachute, there is danger of becoming langical in the shroud lines and drowning. Dan Smith used to unbuckle his harness, hang by the arm loops and then, when within filteen feet of the water, make a high dive into it, let ha the 'chute come down by fiself. Iromcally enough, it was in water that Smith met badeath. He is believed to have been uttacked by gramps when he landed in the swirling currents of the Delaware River, during a jump at Port Jervis, N. Y., last year,

At least 100 times I have piloted ships from which parachute jumpers took off Of all these jumps, probably the queerest was made at Roosevelt Field by Buddy Bushmeyer dressed in a home white Easter rabbit sint, with ears a yard long. We picked a

spot for the jump that would take him right over the grandstand at Roosevelt Field and he had the time of his life wiggling his cars at the children in the audience as he sailed overhead.

In spot landing contests at air meets, Jumpers hap from an altitude of 1,500 feet to see which one can land nearest the center of a 400-foot carele. Some start almost over the circle and make a delayed drop, falling 800 or 1,000 feet before pulsing the ring. This gives the wind less time to drift three away from the mark. Others start farther from the mark, open their parachutes as soon as they are clear of the ship, and try to maneuver into the circle during the long descent.

This is done by steering or "slipping" the chate by pulling down on the lates on the ade toward which you want to move, For every too feet you descend, you can slip your 'chute ten or more feet horizontally in any denied direction. Sometimes, when a jumper is landing in a strong wind, he slips has parachute into the wind just before he touches ground. This reduces the speed at which he strikes and lemens the chances of

ONE of the best buts of parachule maneuvering I remember was performed last year by Joe Crane. He piaced a friend near the center of Roosevelt Field and then came down from 2,500 feet steering his tilk umbirlia so accurately that, if his friend had not moved, he would have planted his feet on his shoulders

The most thrilling jump I ever experienced was when I formed the Caterpillar Club officially over Georgia in the crash of the fli-fated "K," two years ago. In this big snow-white monopiane. I left Romevelt Field, L. I., with two companions, Jimmy Garrigan and Garland Peed, in an attempt to By non-stop from New York to Buenos Aires, Argentina

We took off at dusk. Heading south we ran into ram and mist, then struck tog. For more than eight hours, we flew bland, haveling through air as thick as cotton batting. At three n'clock in the morning, the left wing began to drag. Then a long ominous crack, splitting the cetting of the cable, appeared over our heads. The doomed ship was pulling apart. There was only one thing to do-jump.

Garragan went first, at 5,000 feet, Peed and I balled out next, leaving the ship at 2,500 feet. I tried to get out the cabin door, The strain on the fuselage had twisted it, jamming the door tight. I couldn't budge it. I kicked a hole in the window of the fusciage and wiggled through. The wind raught me, whirled me around, crashed me against one of the steel wing struts. Then, I dropped into the thick for

WHEN clear of the falling plane, I tried to reach across with my right hand to jerk the ring, I couldn't move my arm. The force of working the strut had dislocated my shoulder While I ripped downward through hundreds of feet of fog, I struggled to hook the thumb of my left hand through the ong. When I got it in, I pushed the ring across my thest and the parachute popped into full bloom, just in time,

At present, only Army and Navy flying schools require students to make parachute lumps as part of their training. Some day I believe all flying schools will include such descents as part of the work toward a pilot s license. knowing how to handle a parachute and make a jump is as important to an airman as knowing how to swim is to a sallor,

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# How Jungle Beasts Live Near Big Cities

(Costinued from page 17)

drinks water, the corn swells, and directive

disturbances result.

When evening comes after a busy day, if all the animals are still safe and sound, the keepers heave a sigh of relief. But they can never be sure until they check up. Not long ago, after the day's exchanged had died down at the elephant house, the New York keepers heard "Peter the Great" making trange biccoughing sounds in his pen outside. They rushed out just in time to pull a pop hottle from the hippo's throat and prevent it from choking to death!

Special precautions are taken to keep meateating animals from choking on their food. Every piece of home meat or beef that is tossed into a cage has a bone in it. If solid meat were given the blg cats, I was told, they would swallow the chunks whole and strangle. By having to tear the meat from the bones, they get it in small shreds.

At night, when the bear dens are silent and the monkey house has quieted down, activity begins in the reptile house. Feeding starts about eight o'clock. Rabbits, ruts, guines pigs, frogs, tadpoles, day-old chicks and occasionally a young pig are on the mean. Every ten days, the Regal pythons feast on ten chickens or a small pig. For three or four months they cut regularly. Then they rest for a month. One captive python from the Island of Borneo, Raymond L. Ditmars, curator of reptiles and maximals, told me, quit eating for twenty-two months.

ONCE a week, the king cobra dines on a plump five-foot gupher snake. This cobra refuses to eat anything but snakes, so a man in Texas has a standing order for approximately 250 feet of gupher snakes a year to feed it. They are shipped north twelve at a time and cost 51.50 spiece. The main food of the other snakes is mice and rais and for them, too, the dinner bell rings once in seven days.

In the daytime, when most of the snakes are sleeping, the Beards and turtles that live in the reptile bouse have their meals. The showy little green lizards gobble down mealworms; the ignams nibble hanaxes; the monitors swallow fresh exas whole without breaking the shells; and, three times a week, the 300-pound Galapagos tortnise packs away fifty bananas or ten heads of letince or two dozen tomstoes at a sitting.

A bird house alone requires a wider variety of foodstuffs than the Waldorf-Astoria. The bill of fare ranges from horse meat to thistle seeds and includes cottage threse, ant eggs, rwieback, chickweed, raisins, milk powder, tabbage, honey, and dried flies! "Mealworm ranches" at New York produce half a mulion wiry little worms a year for the birds. Spectal mills roll and crack grain and an extensive nutsery raises chickweed and other greens. At the Washington, D. C., park, special fly-farms, consisting of wire-mesh boxes, turn out flies for the ligards and birds.

RECENTLY, a ruby-throated humming bird at a new record by living three years and four months in captivity at Bronx Park. The previous mark, established at a western zoo, was two years and a half. In place of the natural food of these little birds, the nectar of flowers, they are fed on a mixture of barley water, honey, condensed milk, and a prepared baby food.

One of the problems of feeding that requires much research and experimenting is finding substitutes for the natural fare of rare specimens. For instance, ant enters are no longer fed unts in the 200. They get muk into which is stirred eggs, natureal and finely-scraped beef. This diet, developed at Brown

Park nater four years of research, supplies the needs of this strange animal and has been widely adopted at other zoos throughout the country.

The total food hill at New York runs to more than \$43,000 a year, that at Philadelphia approximately the same, and that at Washington upwards of \$30,000. On the New York list you find such items as \$5,000 for borse ment, \$3,000 for banancs, \$9,000 for hay and \$1,100 for bread. Among the smaller purchases there are: 334 live sparrows, 770 pounds of cottage cheese, 24 boxes of buckle-berries, 45 pounds of prunes, 279 pounds of cake, and 500 pounds of weed seeds.

Special hospitals equipped with operating rooms, isolation wards, diet kitchens, research and diagnosis laboratories, and mortuaries are part of the equipment of many porks. Here cuts and scratches are dosed with lodine, X-rays made, broken legs set in splints, teeth examined, and operations per-

Cash Prizes for PHOTOGRAPHS

In NEXT month's issue begins a novel and interesting cash prize contest open to amateur photographers. Anyone may compete, for the rules of the contest give either beginner or expert an equal chance to win a prize. Full details will be published in the November issue, on sale October 1.

formed while the animals are under the influence of ether or local anesthetic.

NEARLY fifty drags and remedies are used at the New York park's unimal bospital, including cascara tablets, mustard plasters, cough syrup, Epsom salta, and half a dozen antiseptics. Every new arrival at the zoo is kept under observation for two weeks to be sure it has no contagings disease or unusual parasites. One research man spends his time studying and classifying parasites. Last year, he discovered a hithertounknown type of round worm in a Branick rat.

When deer in one western park became troubled with internal parasites, not long ago, it was found the worms were entering their bodies by way of june-bug eggs which they were eating with gram in the pasture. The deer were ewitched to buy and the pasture was burned over with blowtorches to destroy the earn.

One job a zoo doctor has on his regular schodule is clipping the claws of the lions, tigers, and hears. A special case, equipped with a side that slips over and holds the animal quiet while the work is going on, runs along a track in the basement of the lion house. Recently, Dr. Charles V. Noback, Bronx Zoo veterinarian, astroinistered a dose of the gland extract, pituitrin, to a lioness to aid her in giving birth to cubs. While pituitrin has been used in treating humans

at childbirth, this was the first time in history it had been given to animals.

WHENEVER on enimal dies at a park, its care is thoroughly disinfected and a post-insuriem examination performed to

determine the cause of death. Such as examination, last year, revealed that the world's biggest captive elephant, "Khartoum," had died of heart trouble.

Weighing 10,000 pounds, this twenty-eightyear-old African giant was the most destructive animal ever kept at Bronx pack. A special door that weighed a ton and a half and worked with a worm screw had to be fitted to his cage as he would tear an ordinary door from its hangers,

IN THE summer of 1922, the rarest specimen ever brought to an American soo died after being on exhibition forty-nine days. It was a duck-billed platypus, a strange egg-laying mammai that had been brought 10,000 miles from Australia to New York.

The duck-biff are only shrimps, white graits, and angleworms. In a single day, it would consume half a pound of angleworms, forty shrimps, and as many graits. The cost of feeding the eighteen-inch animal, the only one to be brought afive from Australia, was approximately 55 a day. Because of its nervous temperament, it could be exhibited only one hour a day and visitors, in line, approached its tank in perfect allence.

Twenty-five hundred dollars, or approximately 5500 a pound, was paid for the
duck-hill. That set a record for costly specimens. While "Mogul" is valued at \$25,000,
this rhinoceros weighs as much as a small
switch-engine and so costs little per pound
of thino. "Jimmy" the shoebill "stork."
costing the New York park \$1,400, holds
high place among the birds for costliness.

At present, if you want a pair of Royal Bengal tigers, they will cost you \$5,000. Siberian tigers rue as high as \$10,000 a pair, Jaguars come at \$500, leopards at from \$200 to \$300, None at \$2,000 a pair. A half-grown Baird's tapir costs \$500, polar bear cubs, a year old, \$400; grizzly bear cubs, eight months old, \$300. Zehras selt for from \$1,000 to \$7,000 apiece. A two-year-old female African. chimoceros, forty-one inches high, has a market value of \$4,800, while an Indian thine tuns as high as \$7,000. Monkeys range all the way from \$15 to \$500, according to their species; baboom from \$100 to \$100, chimpansees from \$500 to \$900. Young gorillas sell for \$4,000 apiece. There aren't any old gorillas as they never live long in captivity. When "N'gi" died last winter in Washington, despite efforts to save his life by administering oxygen, he was five years old and had lived longer than any other gorilla had ever lived in captivity in the U.S. A mandellt in full color will bring \$500 and a pygmy hippopotaznus from \$3,000 to \$3,500.

Pythote come at so much a foot. A twenty-five-foot make of this kind will cost \$1,000, or \$40 a foot. Cobras have a flat price of five British pounds, or \$25. King cobras, twelve feet long, fetch from \$150 to \$200. The rare blood python is priced at \$2,500, Rattlesnakes range from \$5 to \$8 with hig eight-foot rattlers going as high as \$15. Emerald tree boas, "the birds of paradise of the snake house," sell for \$75, and the average small snake in a collection costs from \$5 to \$10. The price of lisards runs from fifty cents for little ones to \$75 for the six-foot monitors and \$500 for the rare Komodo Island "dragons," ten feet long.

ANIMALS come to a zoo in three ways. Most of them are bought directly from animal traders who either capture them in the field or buy them from native hunters. Others are donated by explorers who bring them back to civilization on their return from distant countries. And a few come in exchange for other specimens.

POPULAR SCIENCE MONTHLY



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